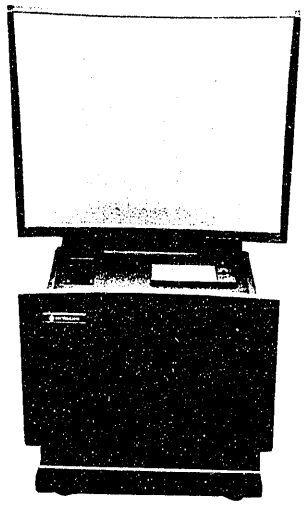
HITACHI
SERVICE MANUAL

YK | No. 786E

CT 5011



CAUTION: Before servicing this chassis, it is important that the service technician read the "Safety Precaution" and "Product Safety Notices" in this Service Manual.

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SPECIFICATIONS AND PARTS ARE SUBJECT TO CHANGE FOR IMPROVEMENT

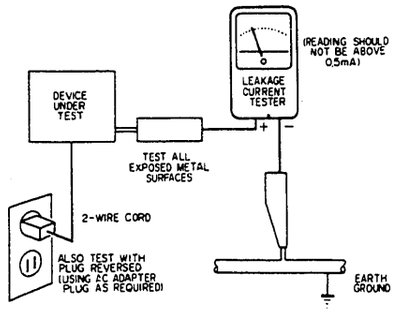
PROJECTION COLOR TELEVISION

November 1981 **YOKOHAMA WORKS**

SAFETY PRECAUTIONS

Before returning any instrument to the customer a safety check of the entire instrument should be made. The service technician must be sure that no protective device built into the instrument by the manufacturer has become defective or inadvertently defeated during servicing.

1. Comply with all caution and safety related notes located on or inside the Projection TV cabinet and on the Projection TV chassis or picture tube.
2. **WARNING:** Alterations of the design or circuitry of this Projection TV should not be made.
   Any design alterations or additions such as, but not limited to, circuit modifications, auxiliary speaker jacks, switches, groudning, active or passive circuitry, etc. may alter the safety characteristics of this Projection TV and potentially create a hazardous situation for the user.
   Any design alterations or additions will void the manufacturer's warranty and will further relieve the manufacturer of responsibility for personal injury or property damage resulting therefrom.
3. **HOT CHASSIS WARNING:** The chassis of Projection TV is connected to one side of the AC supply.
   "Hot" chassis equipment in which the chassis is solidly connected to one side of the AC line cord may be serviced without using an isolation transformer if the power plug is inserted so that the chassis is connect to the grounded side of the AC supply. Check with an AC voltmeter to see if a potential exists between the chassis and a known earth ground. A zero or very low AC reading should be obtained. If a significant reading is obtained, reverse the power plug and recheck for a zero or low meter reading.
   Service on this type of chassis should only be performed with an isolation transformer inserted in the power line between the receiver and the AC supply for protection of both personnel and test equipment.
4. Observe the original correct lead dress. Extra precaution should be taken to assure proper lead dress in the following areas: (a) near sharp edges, (b) that wire or components do not touch thermally hot parts, (c) AC supply area, (d) high voltage area, (e) antenna wiring, (f) inspect for pinched, out-of-place, or damaged wiring in all areas, (g) do not change component configuration (spacing, clearance, etc.). Example: Resistor spaced off of printed circuit board.
5. Components, Parts, and/or Wiring that indicate evidence of overheating (or other damage) should be replaced with Components, Parts, and/or Wiring which meet original specifications. In addition the reason for over-heating and/or damage should be determined and corrective action taken, if necessary, to remove any potential safety hazard.
6. **WARNING:** The picture tube in this Projection TV employs integral implosion protection. Replace with a tube of the same type number for continued safety. Do not remove, install or handle the picture tube in any manner unless shatterproof goggles with side shields are worn. People not so equipped should be kept away while picture tubes are handled. Do not handle picture tube by the tube neck. Keep picture tube away from the body while handling.
7. Protective shields are provided on this chassis for the protection of both the service technician and the customer. Protective shields removed for servicing convenience must be correctly re-installed and **ANY MISSING SHIELDS MUST BE REPLACED. DO NOT OPERATE THIS INSTRUMENT WITHOUT THE PROTECTIVE SHIELDS IN POSITION AND PROPERLY SECURED.**
8. When replacing a chassis in the cabinet, always be certain that all the protective devices are put back in place, such as: non-metallic control knobs, insulating fishpapers, adjustment and compartment covers/shields, isolation resistor capacitor networks, etc.
9. **ANTENNA COLD CHECK**
   With the AC plug removed from the 120V AC source, place a jumper across the two plug prongs. Turn the instrument AC switch on. Using an ohmmeter, connect one lead to the jumpered AC plug and touch the other lead to each exposed antenna terminal screw or coaxial connector (when applicable). The resistance measured should not be less than 1.0 megohm or greater than 5.2 megohms. Any resistance value below or above this range indicates an abnormality which requires corrective action. Repeat the test with the AC swich in the OFF position.
10. **LEAKAGE CURRENT HOT CHECK (ON COMPLETELY ASSEMBLED INSTRUMENT)**
    Plug the AC line cord directly into a 120V AC outlet (do not use an isolation transformer for this check). Use a Leakage Current Tester or a metering system which complies with American National Standards Institute (ANSI C101.1 "Leakage Current for Appliances"), and Underwriters Laboratories (UL) 1410. (50.7). Measure for current with the AC switch "on" and repeat with the AC switch "off" from all exposed metal parts of the cabinet (antennas, handle bracket, metal cabinet, screwheads, metal overlays, control shafts, etc.), to a known earth ground (waterpipe, conduit, etc.): particularly, any exposed metal part having a return path to the chassis. Any current measured must not exceed 0.5 milliamp. Reverse plug in the AC outlet and repeat test. **ANY MEASUREMENT NOT WITHIN THE LIMITS OUTLINED ABOVE ARE INDICATIVE OF A POTENTIAL SHOCK HAZARD AND CORRECTIVE ACTION MUST BE TAKEN BEFORE RETURNING THE INSTRUMENT TO THE CUSTOMER.**


(READING SHOULD NOT BE ABOVE 0.5mA)
LEAKAGE CURRENT TESTER
DEVICE UNDER TEST
TEST ALL EXPOSED METAL SURFACES
2-WIRE CORD
ALSO TEST WITH PLUG REVERSED (USING AC ADAPTER PLUG AS REQUIRED)
EARTH GROUND

AC Leakage Test

11. **X-RADIATION AND HIGH VOLTAGE LIMITS**
    The primary source of potential x-radiation in solid state television receivers is the picture tube. The picture tube is specially constructed to prohibit x-radiation emissions. For continued x-radiation protection, the replacement tube must be the same type as the original. The shields and mounting hardware for picture tubes have an x-radiation protection function and must be properly in place.
    High voltage must be checked each time any service is required that involves B+, horizontal deflection or high voltage. Where used, x-radiation protection circuits (may also be referred to as horizontal disable or hold-down) must be checked for proper operation each time the x-radiation protection circuit is serviced. Refer to the Technician X-radiation Warning note on the Chassis Schematic in the Basic Service Data and Instrument Labels for specific high voltage limits of each chassis and, where used, X-radiation Protection Circuits specifications.
    High voltage is maintained within specified limits by the use of close tolerance safety related components/adjustments in the high voltage circuit. If high voltage exceeds specified limits, check each component specified on the chassis schematic diagram and take necessary corrective action.
12. **PRODUCT SAFETY NOTICE**
    Many electrical and mechanical parts in Projection TV sets have special safety-related characteristics. These characteristics are often not evident from visual inspection nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this Data and its Supplements and Bulletins. Electrical components having such features are identified by shading on the schematics and by (⚠) on the parts list in this Data and its Supplements and Bulletins. The use of a substitute repacement which does not have the same safety characteristics as the recommended replacement part shown in the parts list in this Data and its Supplements and Bulletins, may create shock, fire, or other hazards.
    Product Safety is continuously under review and new instructions are issued from time to time. For the latest information always consult the current HITACHI Service Data. Supplements and Bulletins. A subscription to, or additional copies of, HITACHI Service Data may be obtained at a nominal charge from your HITACHI Consumer Electronics Distributor or from HITACHI Technical Publication.

SERVICING PRECAUTIONS

General

The Solid State devices utilized by this Projection TV is selected to perform efficiently in their specific circuit function.

Order replacement items by stock number from your authorized Distributor.

General precautions to observe when servicing this chassis follows. More specific information is outlined under those special sections associated with this chassis.

1. When servicing this chassis always use an isolation transformer.
2. Do not remove or insert any module with AC power applied to the chassis.
3. Do not check high voltage by drawing an arc. To measure the high voltage use a high voltage meter or a VTVM equipped with a high voltage probe. To discharge the picture tube, disconnect AC power from the chassis and connect a clip lead from the degaussing shield (at the point where the picture tube socket ground lead is attached) to the high voltage anode button on the picture tube.
4. Do not bridge electrolytic capacitors with AC power applied to chassis since resultant surges may damage the solid state devices.
5. When a solid state device is equipped with a heatsink, do not operate the chassis (instrument) with that heatsink removed.
6. Soldering irons utilized where transistors and integrated circuits are concerned should be rated at no more than 35 watts. They should be grounded in such a manner that no voltage will be applied to the device during the soldering or desoldering operation. These precautions are necessary to prevent any possible damage to the device due to excessive heat and/or voltage.
7. Do not use spray type chemicals (especially circuit coolants) as trouble-shooting aids in the vicinity of the module connectors.
   To Clean Module Connector Contacts apply the following described mixture.
   Use a mixture of 10% (by volume) Acetone and 90% (by volume) isopropyl Alcohol (strength of 90 to 99%).
   Use a pipe cleaner soaked with the above solution to clean the module socket connections yoke, convergence plug contacts. Further lubrication of contacts is not required.
8. On some chassis, a DC supply B+ interlock feature is incorporated in the yoke plug and socket. DO NOT defeat this interlock safety feature.
9. Always connect the ground lead of a test instrument to the chassis before connecting the positive lead: conversely, always remove the ground lead of a test instrument last.
10. In the event Shop Service is required, use an APPROPRIATE TEST FIXTURE for this chassis.

CAUTION: When using a test fixture for shop service DO NOT connect the test fixture ground strap to any heatsink on the chassis.

Handling Integrated Circuits

Thoughtful handling procedures and some inexpensive equipment can go a long way towards reducing static electricity damage to integrated circuits. Basic principles include steps to prevent the frequent discharging of static electricity from he human body (and other objects) and avoiding the use of static producing accessories. The following procedures are effective in reducing the possibility of integrated circuit damage due to static electricity:

1. Just before touching any component or module, touch the metal chassis (observe line isolation precautions) to ensure your body is not statically charged.
2. When removing modules from the chassis, place them on a conductive surface such as aluminum foil. Do not place them directly on the floor, carpet or workbench.
3. Touch the metal chassis (observe line isolation precations) just before picking up a module or component for insertion.
4. When removing or replacing integrated circuits grounded-tip solder irons are absolutely essential.
5. Some "solder suckers" generate up to 20,000 volts of charge when triggered and should not be used. Even when the IC being removed is known to be bad, a solder sucker can generate enough static to damage other components on the board. Anti-static solder suckers are available and are essential for IC work.
6. Replacement integrated circuits are packaged in conductive foam or with aluminum foil. Do not remove the IC from its protective package until it is ready to be used. Just before removing the IC, touch the conductive foam to the chassis or circuit board into which it will be inserted. This can be done by touching the board with one hand and the conductive package with the other.
7. Try to minimize motion when handling unpackaged integrated circuits. When seated, the simple action of lifting your feet from the floor can generate static electricity. Clothes readily generate static electricity when brushed against other objects.
8. Do not use freon propelled sprays on the circuit boards or chassis. Freon sprays can generate more than 5,000 volts of static electricity. Even when an IC is in a protective package or soldered into a circuit board, a freon propelled spray can generate static electricity which could damage internal components not directly connected to the IC pins. A short bristle brush (1/2 inch or 1.25 centimeters) with a metal handle is a safer method of clearing debris.

NOTE: In situations where the above guidelines are in conflict with safe servicing procedures, the safety rules come first.

SPECIFICATIONS

GENERAL

Projection System:	3-tube, 3-lens system in line arrangement
Video System:	NTSC specification
Cathode-Ray Tube:	7-in. cathode ray tube with HI-UPF gun
Lens:	Large-diameter, high-resolution plastic lens (F=1.0, f=114mm)
Screen:	Screen size; 50 in. dia. Screen gain; 6–10

RF CHARACTERISTICS

Channels:	VHF: 2-13 & UHF; 14-83 12-position electronic tuning
Antenna Impedance;	300 ohms balanced UHF 300 ohms balanced VHF 75 ohms coaxial VHF

VIDEO CHARACTERISTICS

Brightness:	120 ft-L (white peak)
Resolution:	VIDEO; 400 lines RF; 320 lines
Video Input:	1 volt p-p/75 ohms

AUDIO CHARACTERISTICS

Power Output:	10W + 10W
Speaker System:	2-way, 2-speaker systems; 12cm & 5cm
Audio input:	
AUDIO INPUT:	0.39Vrms/10kohm
Terminal:	RCA Jack

REMOTE CONTROL TRANSMITTER

System:	Infrared wireless control
Power Requirements:	DC 3V

MISCELLANEOUS

Power Requirements:	AC 120V, 60Hz
Power Consumption:	158W (Maximum)
Dimensions:	In operation 78.0(W) x 156.0(H) x 106.5(D) cm 30 - 3/4 x 61 - 1/2 x 42 in. Folded 78.0(W) x 156.0(H) x 70.2(D) cm 30 - 3/4 (W) x 61 - 1/2 (H) x 27 - 3/4 (D) in.
Weight (without pachage):	73.5kg/161.7lb.

FURNISHED PARTS

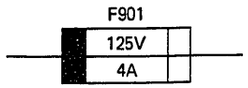
Remote Control Transmitter:	1
VHF Antenna Adaptor:	1
Batteries "AA" size	2
Connecting Cord:	1
Channel Number Sheet:	3
Safety Tip:	1
Operating Instructions:	1

NOTE:
Specifications and the design subject to possible modifications without notice due to improvements.

CAUTION

The following symbol near the fuse indicates fast operating fuse to be replaced.
Fuse ratings appear within the symbol.

Example



Fuse Symbol No.	Ratings	Physical Location
F901	125V 4 A	Power/Def. P.C.B.
F903	125V 1.5A	Power/Def. P.C.B.
F905	125V 0.8A	Convergence P.C.B.
F906	125V 0.8A	Convergence P.C.B.
F907	125V 2 A	Fuse P.C.B.
F908	125V 2 A	Fuse P.C.B.
F909	125V 4 A	Fuse P.C.B.

Replace with the same type fuse for continued protection against fire.

GENERAL INFORMATION

The CT5011 Projection Television receiver is a three-CRT video projection system equipped with a 50-inch (diagonal) aluminized viewing screen. It produces picture brightness levels of up to 120 foot-lamberts. The CT5011 is equipped with three single-phosphor color picture tubes (additive primary colors – red, blue, green). The image from each tube is projected through an F-1.0 three-element plastic lens assembly onto a mirror, which reflects the image onto the large viewing screen. The mirror is mounted on the back side of a hinged cabinet panel that, in the "storage" position, serves as the cabinet front and top. For viewing, the panel is swung forward so that the mirror is correctly positioned in front of the projection lenses.

The CT5011 is equipped with a random-access tuning system that allows either direct or remote selection of up to 12 preprogrammed VHF and/or UHF channels.

A rear panel on the CT5011 cabinet has input jacks for external video and audio, and connectors for an external stereo speaker system. The video input (75-ohm) is selected by a front-panel **TV/AUXILIARY** switch. With this switch in the Auxiliary position, 1-volt negative-sync video signal (such as that from an HITACHI Video Cassette Recorder) can be used to drive the CT5011 video circuits.

Auxiliary stereo audio is offered by the two-channel audio amplifier system (10 watts per channel). Each audio channel has a 5-inch woofer and a 2-inch tweeter.

External input jacks are provided for the left and right audio channels. A 0.5 to 1-volt signal across the 10,000-ohm input impedance of each audio channel input will drive the audio amplifiers to full output. The TV position of the TV/AUXILIARY switch (on the front panel) connects the two channels in parallel for monophonic audio during TV reception. The MONO/STEREO switch (on the Auxiliary input panel) connects the two auxiliary audio input jacks in parallel for monophonic sound, or "separates" them for stereo sound.

The CT5011 is shipped in two "packages". One package is the TV projection unit, and the other contains the screen and screen-mounting hardware.

The television package includes an infrared remote-control hand unit, which gives the viewer remote control of On/Off, Channel Up/Down or random-access channel selection. Volume Up/Down, and Audio Mute. Two "AA"-size batteries power the remote-control hand unit. These batteries, which are included with the CT5011 , give about two years of hand unit operation with normal use.

Three sets of channel-number tabs are included in the TV package. A set of small tabs is for insertion beside the direct-access channel selection buttons on the remote hand unit. A set of medium size tabs is for insertion in the channel-number display beside the channel-selection buttons on the CT5011 control panel. A set of large tabs is for insertion in the channel indicator immediately below the projection screen.

Antenna inputs to the CT5011 are 75-ohms VHF via a standard "F" connector and 300-ohms UHF. For those desiring to use a 300-ohm VHF antenna system, a 75/300-ohm matching transformer must be used. Because of the larger size of the picture displayed by the CT5011, signal problems that might not be noticed on a smaller screen color television receiver will become noticeable. Consequently, it is important that the CT5011 be provided with a clean, ghost-free signal of adequate strength (minimum 1000mV) to produce a snow-free picture. Because nonshielded 300-ohm antenna lead can pick up secondary (indirect) signals that cause ghosting, it is recommended that the CT5011 be connected to a VHF antenna system equipped with 75-ohm shielded cable. The UHF antenna cable should be a low loss shielded 300-ohm type. Alternatively, a single low-loss 75-ohm coaxial cable can be used with a suitable VHF/UHF splitter to provide signals to both the VHF and UHF antenna inputs.

1. Installation

(1) The projection unit and the screen are packaged separately. Open the large box containing the projection unit and remove the package containing the channel-number tabs, remote hand unit (with accompanying batteries), and the VHF antenna-matching transformer.

(2) Open the screen box, which contains the viewing screen, the two screen support posts, and the other screen mounting hardware. Although the screen is lightweight, it is recommended that two people mount the screen on the video projector unit. First, attach the two screen-support brackets to each side of the instrument back using four screws (follow instructions provided). Next, carefully lift the screen into position. One person then should hold the screen in position while the other installs the four mounting screws – one screw at the top of each side of the screen and one at the bottom on each side.

(3) For the most enjoyable television viewing, the CT5011 should be installed in a room in which the lighting can be adjusted for optimum TV viewing. Position the CT5011 and/or the room lighting to eliminate or minimize room light reflection from the viewing screen.

(4) Connect the VHF/UHF antenna leads and any external video and audio sources and external 8-ohm speaker systems furnished by the customer.

(5) Roll the projector unit into its final viewing position. The CT5011 is equipped with concealed casters. Lock the front casters to prevent movement.

(6) Tune in each of the desired active TV-channels. The CT5011 is equipped with a programmable varactor tuning system. Tuning is accomplished by: (a) Depressing the **CHANNEL-SELECTOR** button, (b) Positioning the associated band-selector switch to the desired band (low VHF, High VHF, or UHF), and (c) Adjusting the **FINE-TUNING** control to produce the best picture and sound on the desired channel. As each channel position is tuned, the appropriate channel-number indicator tabs should be installed in that channel position on the remote hand unit, the auxiliary control door, and the channel display located under the viewing screen.

2. Cleaning the Screen

The aluminized screen is fragile and can be easily damaged by mishandling. However, it can be cleaned by the following methods: Loose dirt or dust on the screen can be removed by **gently** wiping the screen with a **clean, soft cloth.** If the dirt or dust cannot be removed by gently wiping with a dry cloth, use a **soft** cloth dampened with a **mild** detergent solution, then rinse the screen with a clean, soft cloth dampened with **clear** water. The screen then should be gently wiped dry with a clean, soft cloth. Use the same procedures to clean the three projection lenses.

3. Center Convergence

Center, or static, convergence of the CT5011 is accomplished by adjustment of four customer controls beneath a sub-panel in the tuner-control unit. These controls are labled R/B Vertical, R/B Horizontal, G Vertical, and G Horizontal. First, the red and blue images are registered upon each other, and then the green image is registered upon the converged red and blue images. A crosshatch pattern generator in the CT5011 provides the test pattern required for center convergence adjustment.

To set center convergence: (1) Select an active channel, to provide sync for the crosshatch pattern generator. (2) Depress the front panel TEST PATTERN switch, to display the crosshatch pattern on the screen. (3) Adjust the R/B Vertical and R/B Horizontal Center controls for best red/blue image convergence at the center of the screen. (4) Register the green image on top of the red/blue image by adjusting the G Vertical and G Horizontal Controls.

NOTE: It is easier to see the red/blue imges converge if you cover the green projection lens with a piece of carboard. Alternatively, the GREEN VERTICAL and GREEN HORIZONTAL controls can be misadjusted to move the green crosshatch away from the red and blue crosshatches.

4. Gray Scale Tracking

Adjustment of picture gray scale should not be required during initial installation. However, if color shading appears in the highlights or lowlights of a black and white picture, touch-up adjustment of the gray-scale tracking should be performed. The CT5011 is equipped with **screen** and **drive** controls that function and are adjusted much like those of conventional color TV receivers. A screen control is mounted on each of the three CRT driver circuit boards. Each controls the cut-off characteristics of its respective picture tube. Only the red and blue CRT driver circuit boards have video **drive** controls. The green CRT has fixed drive. The red and blue CRT drive controls are used to match the highlight intensities of the red and blue CRT's to that of the green tube to achieve a neutral 6500°K highlight white.

Screen control adjustment should be performed in a darkened room. The procedure is: (1) Position a large mirror so that the projection screen can be seen from behind the instrument (or the wood panel over the top of the picture tubes can be removed and the screen viewed from behind the set via the mirror mounted on the pull-out door of the projection unit). (2) push forward the **service** switch (located on rear lower edge of signal board) to collapse the raster and obtain the normal "service" line. (3) Adjust the **screen** controls one at a time to produce dim colored lines. (4) Reset the **service** switch to its "normal" position, to restore full picture scan.

Highlight tracking is accomplished by adjustment of the **RED** or **BLUE DRIVE** controls to obtain neutral 6500°K highlight white in a black-and-white picture. To obtain a black and white picture, turn the **COLOR** control to minimum and misadjust the fine tuning so that there is no evidence of color on the screen. Then adjust the appropriate **DRIVE** control(s) to obtain neutral gray. Alternatively, a video generator blank raster or superpulse pattern can be used to set the **DRIVE** controls.

5. Overall Set-up

It is unlikely that the projection unit will require overall setup during the initial installation. However, if overall setup is deemed necessary, charts in this Servive Data give simplified picture tube adjustment and color convergence procedures.

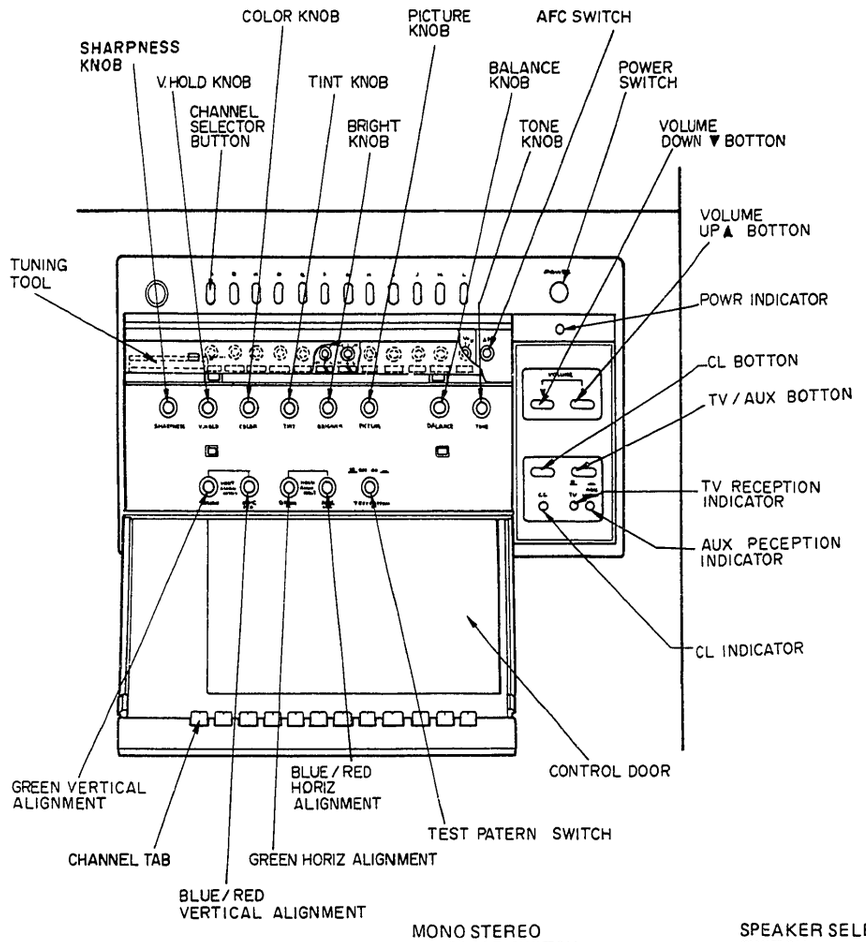
6. General Description

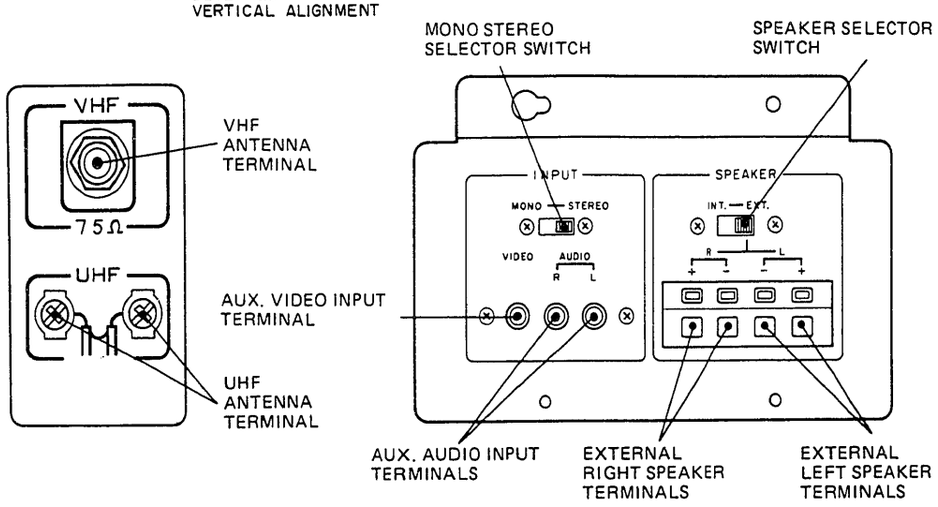
The CT5011 Projection Television Chassis consists of several printed circuit board assemblies. They are: Convergence, ET Tuner (Tuner mount), Video & Audio I-F processing, CRT Drivers (3 each), Power/Deflection, Remote Amplifier, Remote Power, Signal Processing (Luminance Chroma), Tuner Control, and several small circuit board assemblies. The CRT drive circuits are located on three separate CRT socket circuit boards. They drive three 7" (6V) **single** color picture tubes (Red, Green and Blue).

The CT5011 utilizes a Saw Filter and single chip I-F processing circuit, a Comb Filter (featuring a glass delay line), a combined Luminance/Chroma processing chip, a built in test signal (crosshatch pattern), a combined Horizontal/Vertical oscillator chip with built-in X-Radiation protection, and a rather unique convergence circuit using low level vertival and horizontal pulses. The CT5011 features a NON-ADJUSTABLE anode voltage of 25kV (dim picture) driving 3 ea. 7" single color picture tubes.

The most significant new feautres in the CT5011 is the inclusion of a test signal (crosshatch pattern) and the unique convergence circuit which is required for projection television systems. Serviceability of the CT5011 projection television chassis is enhanced by the physical arrangement of circuits on the various circuit board assemblies. The boards are further enhanced by prominent road mapping on the various circuit boards. In addition, a component numbering system is utilized which relates to circuit application and will aid in readily locating individual components.

CONTROLS





CIRCUIT OPERATION OVERVIEW

1. Control/IF Circuit Board

The video and sound I-F, and demodulation circuits are mounted on the control/I-F circuit board. A SAW filter I-F system eliminates almost all alignment adjustments. The bandpass shaped output of the SAW filter is applied to IC 201, the video processing intergrated circuit. This IC contains a three stage I-F amplifier, the video detector video amplifiers, and the frequency detector for the automatic fine tuning system.

The video output from IC 201 is applied to two low-level video amplifier stages and then to the **TV/AUXILIARY** input selector switch, the output of which is routed to the video signal-processing board.

Sound signal processing is accomplished by a single sound chip (IC 402) and a ceramic filter. The sound output of IC 402 is applied to the TV audio/external audio section of the **TV/AUXILIARY** input selector switch. Output from the switch (TV audio or external audio) is applied to a dual-section audio-control IC, which interfaces with the volume control circuits. Level-regulated audio is then applied to the signal processing circuit board.

Also mounted on the control/I-F circuit board assembly are: (1) four **center-convergence** controls. Which are used to adjust static convergence: (2) a **TEST-PATTERN** switch, and (3) an **AUTOMATIC PICTURE** switch.

2. Signal Circuit Board

This circuit board contains two audio preamplifier stages, the crosshatch test pattern generator, and the video/chroma signal processing circuits. Video either from the TV demodulator circuits on the control/I-F circuit board or from the external video input is applied to two stages of video amplification and then to a comb filter, which uses a "1-H" glass delay line. At the output of this delay line the signals are subtracted and added to obtain the black and white (luminance) signal and the chroma signal, respectively. The luminance signal is processed by three additional video amplifier stages, and then is applied to a video amplifier that has a customer adjustable **SHARPNESS** control. The output of this video amplifier is applied to IC 510, the video/chroma processing chip.

The chroma signal, from the "1-H" delay line, is buffered by a single emitter-follower stage, and then is applied via a bandpass transformer to the chroma processing circuits in IC 501. After chroma demodulation, the chrominance signal is recombined with the luminance signal creating separate red, blue, and green video signals. Each of these video signals is applied separately to the driver circuit of its respective picture tube.

The audio signal from the control/IF circuit board is processed by two audio preamplifiers – one for the right channel and one for the left. These preamps include the customer **AUDIO-BALANCE** control. The left- and right-channel audio signals from the signal processing circuit board are then routed to a modularized two-channel (10-watts per channel) stereo power amplifier, which is mounted on the power/deflection circuit board.

3. Selector Circuit Board

The selector circuit board contains twelve tuning potentiometers and their associated band-selector switches. The board also contains channel-select chip. IC 201. This is a 16 line (12 lines used) driver IC that contains a scan oscillator and up/down counter and memory circuits. IC201 is used for remote channel up/down and direct-access channel tuning.

The selector circuit board also contains the bandswitching transistors that select low-band VHF, high-band VHF, or UHF operation of the combined VHF/UHF tuner. Also mounted on this board is a tuning voltage regulator that provides regulated voltage to the tuning potentionmeters.

4. Remote Control System

The remote control transmitter (hand unit) and receiver use pulse position modulation of an IR (infrared) beam. An IR detector (photo-diode), mounted in the CT5011 cabinet (near the large channel indicator numbers beneath the viewing screen), detects the modulated IR beam transmitted by the hand unit. The pulse signal from the hand unit is processed by an IC amplifier that is mounted on a small board with the IR detector. This amplified output is applied to a preamplifier on the remote control board. The preamplifier output drives a schmitt-trigger circuit that converts the signal into a digital pulse train for application to IC 101. This device is a remote-control receiver LSI that develops the control voltages needed to change channels, change volume, turn the set on and off, and mute the audio.

Operating voltage (+12V DC) is applied to the remote-control circuit board whenever the cabinet mirrored panel is in the viewing position. The operating voltage is developed by a remote-control power supply board that contains a bridge rectifier and a regulator IC, which are powered by a separate power trsnsformer mounted on the cabinet floor. The remote-control power board also contains an AC power switching relay that turns the instrument main chassis power on and off.

5. Power/Deflection Board

The power/deflection circuit board contains a fullwave bridge power supply and a conventional series regulator circuit, which provides a precisely regulated +110 volts. This regulator circuit is on two thick-film modules which are **not** field serviceable. Module M901 contains the error-sensing transistor and the series-regulator transistor. Module CP 902 contains a precision voltage-divider and reference-voltage source. The regulated +110V DC powers a conventional NPN transistor horizontal-output stage, which drives the three picture-tube deflection yokes and an FBT (Integrated High-Voltage Transformer). The FBT provides 25.0 kV second-anode potential at zero beam current. The FBT also supplies low-voltage sources that power most of the circuits in the receiver. These sources include +12 volts

which is the primary B+ distribution buss in the receiver and a +60-volt source which powers the vertical-output circuit.

Another thick-film module, M701, contains a horizontal/vertical driver IC that generates and synchronizes the horizontal- and vertical deflection drive signals. The vertical drive signal is applied to vertical amplifier and vertical output circuits that also are mounted on M701. An off the module stage switches "on" at the beginning of vertical retrace to apply +110 volts for rapid vertical retrace and to conserve power.

The horizontal drive signal exits the module and is applied to the horizontal output transistor via a driver transistor and a horizontal driver transformer.

Other discrete circuits on the power/deflection board include a three stage **horizontal keystone** amplifier circuit and a **vertical bow** amplifier circuit. These two circuits intentionally distort the rasters of the three color picture tubes to correct the picture distortion that otherwise would result because the images are projected from below the midpoint axis of the screen. By introducing a predetermined amount of "keystone" and "bow" distortion to the three rasters, it is possible to cancel the keystone and bow that occur as a result of the projection process.

As previously mentioned, the power/deflection board also contains a modularized 10 watts per channel stereo power amplifier. Operating voltage for this amplifier (+30 volts) is developed by a separate fullwave-bridge rectifier and filter system.

6. Convergence Circuit Board

The convergence circuit board converts signals from the horizontal and vertical deflection systems into corrective signals that are applied to the convergence yokes of the three picture tubes. Three signals from the power/deflection board are applied to the convergence board: a vertical pulse, a horizontal pulse, and a horizontal parabola. The vertical pulse is converted into two other signals – a vertical sawtooth and parabola signal – producing a total of four basic "correction" signals, with both negative and positive polarity. Through a matrix of controls and appropriate driver circuits these four signals are combined, in proper amplitude and phase, to develop the complex convergence yoke waveforms required to modify the normal raster of each of the three color pictures so that they will properly register (converge) when projected on the viewing screen.

7. Power Supply

The primary power source of the CT5011 is a full wave bridge rectifier, located on the Power/Deflection circuit board, developing approximately 120V DC applied to the voltage regulator circuit which provides a regulated +110V DC to operate the Horizontal output system. The main distributed +12V DC power supply, the Vertical deflection +60V DC power supply and various operating pulses are derived from the secondary windings of the Flyback Transformer (T704). A second full wave bridge rectifier circuit developing +30V DC is utilized to power the dual channel audio output Integrated circuit located on the Power/Deflection circuit board assembly. There is also a regulated +12V DC power source developed and utilized exclusively by the remote control amplifier, it is located on the Remote Control Power supply circuit board assembly.

The CT5011 utilizes a power transformer operated power supply creating an **"Isolated Ground"** (cold chassis) system even though the main distributed +12V DC and vertical deflection +60V DC supplies are derived from the FBT secondary windings.

8. Automatic Fine Control (AFC)

The CT5011 is equipped with AFC. The AFC circuit is designed to assist in correction of the local oscillator, in the event of drit, up to a maximum of ±1 MHz (where color and sync are lost).

9. Tuning System

The CT5011 utilizes a varactor tuned combined UHF/VHF tuner in conjunction with an infrared remote control system featuring random access and scan up/down channel tuning, on/off, volume up/down and mute functions. There are 12 channel positions available, with each position capable of being tuned on the low VHF (2-6), high VHF (7-13) or UHF (14-83) band.

DISASSEMBLY

1. Cabinet Back Removal (Fig. 1)

Before removing the cabinet back read **"Safety Precautions"** on page 2 of this Service Manual.

(1) Disconnect power cord from AC outlet.
(2) Disconnect antenna lead from antenna block assembly at left center of cabinet back.
(3) Remove nine (9) 1/4" hex head screws: Three (3) from top edge of cabinet back, three (3) each on left and right sides. Remove two screws from I/O terminal. (A). Remove two screws from Antenna terminal (B).
(4) To replace cabinet back, reverse procedure.

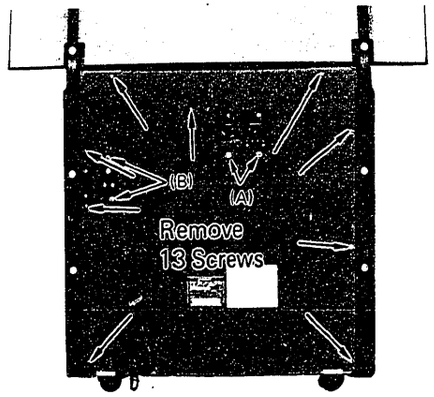


Fig. 1 Cabinet Rear View

2. Top Cover Removal (Fig. 2)

Remove sixteen (16) phillips head screws (use + screw driver), as indicated.

Removal of the instrument top cover affords greater accessability during setup and servicing procedures.

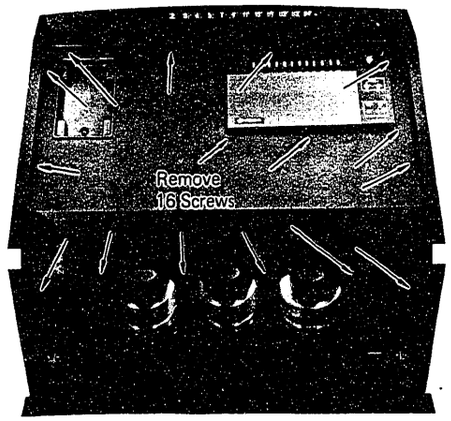


Fig. 2 Cabinet Front View

3. Power/Deflection Circuit Board Chassis Removal

Remove two (2) phillips head chassis bolts (A) (Fig. 3) chassis can now be slid to the rear for ease of servicing (Fig. 3). Interconnect wiring must be freed from wire ties. For complete removal of Power/Deflection circuit board chassis remove interconnect wiring plugs and sockets, H.V. Anode leads and CRT Drive sockets from picture tubes. Remove chassis for major service (Fig. 4). To replace, reverse procedure.

Fig. 3 Power/Deflection Board Removal

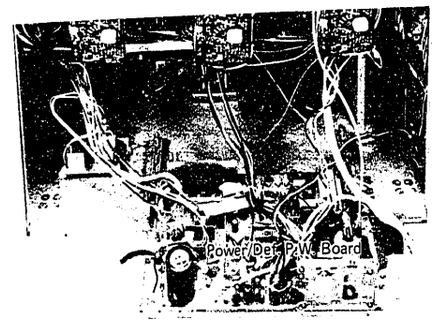


Fig. 4 Power/Deflection Board Service Position

4. Convergence Circuit Board

To remove the convergence circuit board from the cabinet for servicing or convergence adjustments – unfasten plastic retaining clamps and tilt board slightly away from the cabinet wall, then lift circuit board up and out of the cabinet (Fig. 5). Release wire ties (at back of cabinet) capturing the convergence board cables. To replace reverse procedure.

Note: Sufficient lead length is provided for performing service or convergence adjustments from the front of the instrument.

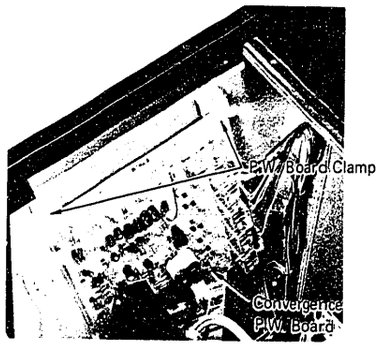


Fig. 5 Convergence Circuit Board Removal

5. Control Block

Note: Cabinet top cover must be removed to facilitate removal of the control block.

Loosen 2 phillips head screws (use + screwdriver) located toward front of cabinet (Fig. 6). Slide control block assembly forward slightly and lift up to remove from cabinet mounting position. To replace, reverse procedure.

Minor servicing and service adjustments can be performed by placing a rubber mat or soft pad on the lens assembly and resting the control block on it. However for major servicing it is recommended that the control block be removed out the back of the instrument. To replace, reverse procedure.

6. Input/Output Terminal Block

Remove video and audio connectors from Aux circuit board.

Remove 2 phillips head screws (use + screwdriver) used to mount input/output block and remove block from cabinet back. To replace, reverse procedure.

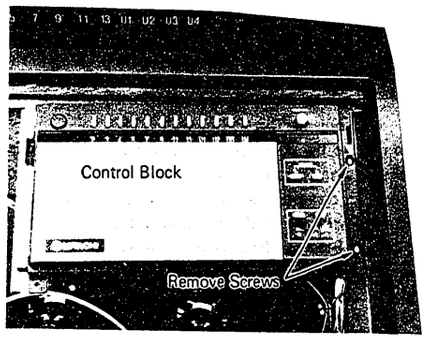


Fig. 6 Control Block Removal

7. ET Tuner Assembly

Remove 2 phillips head screws (use + screwdriver) and interconnect cables and sockets from the selector circuit board and Control/I-F circuit board. Remove ET Tuner Assembly (Fig. 7). To replace, reverse procedure.

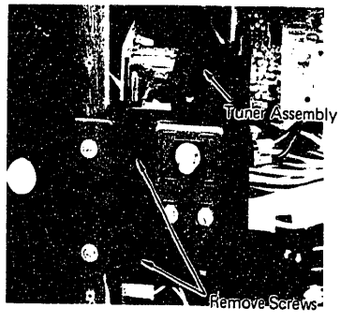


Fig. 7 Tuner Assembly Removal

8. Picture Tube Removal

Remove high voltage anode lead.

Caution: Discharge high voltage anode to chassis before removing high voltage anode lead from picture tube.

Remove CRT driver/socket assembly from base of picture tube.

Loosen deflection yoke clamp and remove deflection yoke assembly.

Remove 4 hex head screws (one at each corner of tube) and remove picture tube (Fig. 8).

Note: Do not discard braided ground strap or springs they must be re-used.

To replace, reverse procedure.

Fig. 8 Picture Tube Removal

Caution: Included with replacement picture tube is a package of special silicone grease which is to be generously applied around the picture tube anode button before replacing anode lead and cap.

9. Remote Control Amplifier

Remote control amplifier circuit board assembly removal from the control block assembly is accomplished by first removing the six interconnect plug and cable connectors, then squeeze together the ears of the four plastic standoff's on which the circuit board is mounted (Fig. 9). To replace, reverse procedure.

10. Selector Circuit Board

Selector circuit board assembly removal from the control block is accomplished by removing seven(7) phillips head screws (use + screwdriver) and seven (7) interconnect cable plug/socket connectors.

11. Control/I-F Circuit Board

Control/I-F circuit board assembly removal from the control block is accomplished by removing four (4) phillips head screws (use + screwdriver) and fifteen interconnect cable plug/socket connectors (Fig. 10). To replace, reverse procedure. Fig. 11 is service position for Control block.

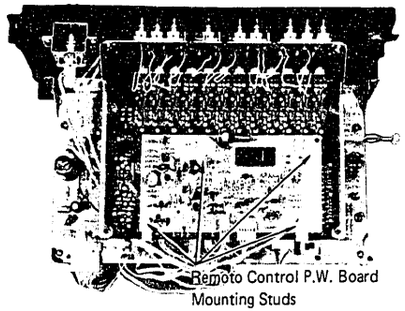


Fig. 9 Remote Control Amp/Selector Circuit Board Removal

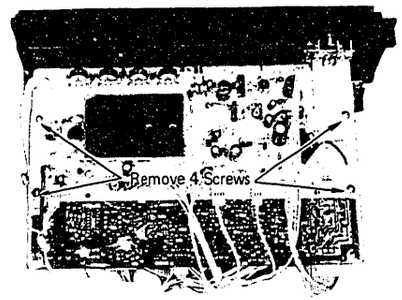


Fig. 10 Control/I-F Circuit Board Removal

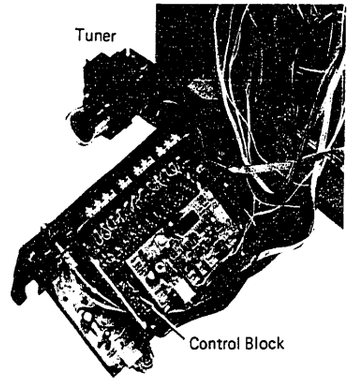


Fig. 11 Control Block Service Position

SERVICING ADJUSTMENTS

Read **"Safety Precautions"** on page 2 of this service data before servicing Projection TV.

1. Optical System Adjustment

(1) Stay adjustment (MIRROR DOOR)
(2) Place instrument facing north or south.
(3) Tune in an active channel.
(4) Set TEST PATTERN switch, located on customer control panel, to "ON" position.
(5) Loosen Hex-nuts (Locking Nuts) on top end(s) of stay-cylinder(s), Fig. 12.
(6) Adjust by rotating stay-cylinder to obtain equal overscan at Top and Bottom of SCREEN. In other words, adjust the center of the picture image to the center of the SCREEN. Tighten hex locking nut when adjustment is complete.

Note: Stay cylinders should be evenly adjusted. Be certain, by lightly jiggling door, that no excessive play exists in either stay cylinder shaft.

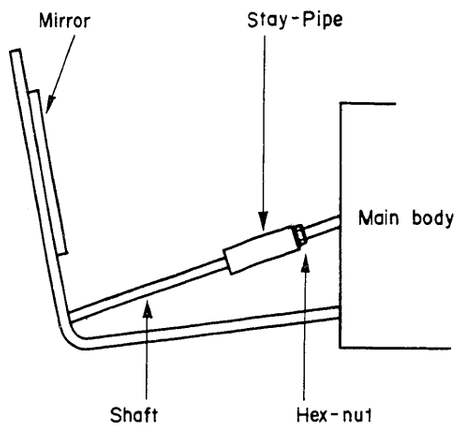


Fig. 12 Stay Cylinder Adjust

2. Optical focus adjustment

Instrument should be operated a minimum of 10 minutes prior to performing set up adjustments.
Project TEST PATTERN (cross-hatch) signal on the screen and set Brightness control to maximum.

Electrical focus adjustments should have been previously performed.

(1) Loosen lens tightening wing nuts at the top of the lens mounts (Fig. 13) so that the front cylinder of the individual lenses can be turned.

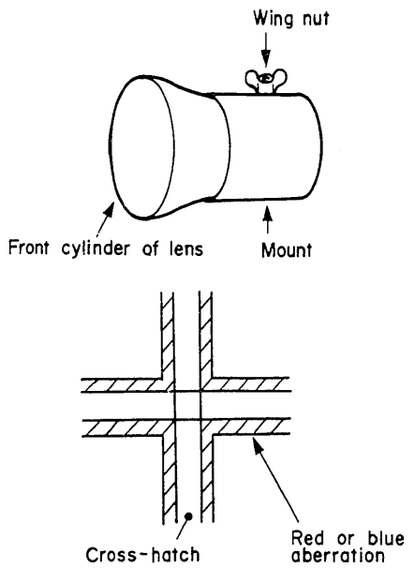


Fig. 13 Static Focus Adjust

(2) Cover any 2 of the 3 lenses (R,G,B) and project a single color on the screen (The order of R,G and B adjustment does not matter).
(3) Watch within a range of ±3 grids vertically and horizontally from the center of the SCREEN, and set the lens so that the line width of the cross-hatch pattern is at a minimum (Adjust for best focus).
(4) Tighten the wing nut.
(5) Repeat steps 2 thru 4 for the two remaining lenses.

Note: When tightening the wing nuts for each color lens watch the cross-hatch signal. Be careful to avoid defocussing due to possible play in the lens mounting assembly.

3. Deflection Yoke Tilt and Picture Centering

(1) Cover any 2 of the 3 (R,G,B) lenses, project one color on the screen.
(2) Place Service Switch, S2001, in service position.
(3) Loosen yoke clamp and adjust yoke tilt for straight Horizontal line at center of screen.
(4) Place Service Switch, S2001, in "Normal" position.
(5) Use an appropriate signal, Indian head, etc., and rotate centering rings (located on rear of Yoke) to center image on screen.
(6) Repeat above steps for each color, observing that the three color images produce only one matched image when adjustments are completed.

4. AGC Delay

The AGC Delay control (R210) has been preset at the factory for optimum operation over a wide range of R-F signal input conditions. Readjustment of R210 should not be considered unless; VHF tuner has been replaced, I-F circuit has been repaired, control (R210) has been misadjusted or unusual local signal conditions exist such as:

(1) Cable TV – adjacent channel interference.
(2) Picture bending and/or Channel 6 color beats which are usually due to excessive R-F signal input when receiver location is close to transmitting tower or when receiver is connected to an antenna distribution system where R-F signal has been amplified. Signal should be attenuated at the antenna with pad or filter to a more satisfactory signal level.
(3) Picture noise is caused by "broadcast noise" or weak signal. If broadcast is "clean" and the received R-F signal is at least 1mV, the picture will be noise free in any area.

Note: Adjustment of the AGC Delay control may not have any visible effect at all except under unusual conditions.

Adjusting the AGC Delay control to one end of rotation will usually provide a relatively poor signal-to-noise ration, and at the other extreme end of rotation of a degradation of overload capabilities such as Channel 6 color beat or Cable TV adjacent channel interference.
If AGC Delay control (R210) is adjusted, check all local channels for proper operation.

5. Vertical Size and Vertical Linearity

At nominal 120V AC line voltage, adjust Vertical size and Linearity controls, R602 & R632, for approximately 5% to 10% overscan at top and bottom of projection screen.
Place "Test" switch (located on Customer Control Panel) to "On" position. Adjust Vertical Size Control (R602) for approximately 5% to 10% overscan. Adjust Vertical Linearity Control (R632) for equally spaced Horizontal lines top to bottom.

6. Vertical Hold

The vertical hold control is located on the Customer Control Panel.

7. Vertical Centering

Moving the vertical centering tap will cause the picture to shift up or down (Tap "D" picture moves down, Tap "U" picture moves up, Tap "N" is a neutral position and will cause no shift in picture). Select tap which affords best vertical center position.

8. Horizontal Size

(1) The horizontal deflection system should not overscan by an appreciable amount (hold to approximately 5% to 10% overscan).
(2) The horizontal size coil (L702) and horizontal linearity coil (L705) are factory preset and should require no further adjustment unless picture tube(s), deflection yoke(s) or FBT is replaced and results in underscanning.
(3) If Horizontal Size adjustment are deemed necessary proceed in the following manner:
(4) Place "Test" Switch in "ON" position (Project Crosshatch pattern on screen).
(5) Adjust horizontal size coil (L702) for approximately 5% to 10% overscan left and right sides.

9. Horizontal Frequency (HOLD)

Due to improved noise immunity, a non-keyed I-F/AGC circuit and increased horizontal pull-in range, the horizontal oscillator circuit no longer requires a service adjustment or customer operated horizontal hold control.

10. High Voltage

High voltage is not adjustable. **Do not measure high voltage at picture tube anode.**

(1) Measure DC voltage at pin 19 of vertical, horizontal substrate module M701. A voltage measurement of 107.3V ±3V, at this point, places high voltage within acceptable limits of approximately 25.0kV.
(2) High voltage for CT5011 is approximately 25.0kV when measured with a VTVM as described and should not exceed 29.6kV (118.8V at pin 19 of M701) under any circumstances.

11. Service Switch
The service switch (S2001) is a two position slide switch located in the lower rear corner of the signal circuit board. The two positions are NORMAL and SERVICE (collapses the raster to horizontal line).

12. White Raster
To obtain a White raster, as required for screen purity and color temperature adjustments. Place short jumper wire (clip lead) between base of Q2053 and collector of Q2011.
Note: Test Pattern switch must be in "ON" position.

13. Vertical Bow Adjustment
Adjust the vertical Bow Control (R622) so that a straight left to right horizontal centerline balance is obtained (minimum line distortion).

14. Keystone Adjustment
This adjustment is factory preset and should require no further adjustment.
(1) However if adjustment is required adjust R727 for straight vertical lines left and right sides with minimum distortion.
(2) For best results instrument should be operated a minimum of 10 minutes prior to performing set up adjustments.

15. Electrical focus adjustment
(1) Tune in an active channel. Switch test pattern switch "ON" to receive cross-hatch signal.
(2) Set the picture (contrast) control to maximum, and the brightness control to the center of its rotation.
(3) Cover any 2 of the 3 (R,G,B) lenses and project a single color onto the screen.
Adjust appropriate focus pack control (R,G,B) for best overall focus (focus pack located on rear of instrument). Repeat procedure for remaining 2 colors.

16. Color temperature adjustment
(1) Turn the auto-picture (auto-color) switch "OFF".
(2) Obtain white raster.
Note: To obtain white raster place jumper wire from Q2011 collector to Q2053 base.
(3) Set the drive controls (red, blue) to their respective center of rotation.
(4) Turn the screen controls (red, green, blue) fully counterclockwise.
(5) Push service switch S2001 located (at lower rear of SIGNAL circuit board) forward (service position).
(6) Advance each screen control (red, blue, green) gradually clockwise properly mixing them to obtain a white service line.
(7) Return S2001 to its original position (normal position).
(8) Turn the picture (contrast) and brightness controls fully clockwise.
(9) Adjust the Drive controls (red, blue) to obtain a neutral 6500° highlight white.
(10) Remove jumper wire previously inserted to obtain white raster. Tune in a black and white picture. Rotate brightness control through its range and check gray scale tracking.
Should any color other than gray or white be dominate in lowlight to highlight areas, the color temperature has not been correctly adjusted. Repeat color temperature adjustments (screen controls adjust lowlight areas, drive controls adjust highlight areas).

17. Sub brightness control
(1) Turn the auto picture (AUTO COLOR) switch "ON".
(2) Tune in a local color signal.
(3) Set the PICTURE (contrast), BRIGHTNESS, COLOR and TINT controls to their respective centers of rotation and adjust sub brightness control, R313, for the desired brightness level.

18. Sub color control
(1) Auto picture (AUTO COLOR) switch "ON".
(2) Tune in a local color signal.
(3) Set the picture (contrast), brightness, color and tint controls to their respective centers of rotation.
(4) Adjust sub color control, R506 to obtain desired color level.

19. Sharpness Control
Clockwise rotation of Sharpness Control (R305) increases picture sharpness while a softer picture is obtained by turning the control counterclockwise. This control should be adjusted to optimize the quality of the picture.

20. +20V Adjust Convergence Circuit
(1) Connect VTVM positive lead to collector of Q902.
(2) Adjust R921 to produce +20V ±0.3V.
(3) Check voltage at collector of Q904, should be -20V ±1.5V.

21. Initial Volume Adjust
With mirrored door closed remove cabinet back.
Open mirror door and turn instrument "ON" and tune to an active channel. Adjust initial volume level control, R0133 (located on remote control printed circuit board) for desired initial volume level.
Note: This instrument has last channel recall and volume level memory as long as the mirror door is open. A door switch. located in te upper right corner, turns off all power to the instrument when the mirror door is closed causing the loss of last channel recall and volume level memory. Therefore initial "turn on" is to channel 2 and initial volume level setting.

HIGH VOLTAGE HOLD DOWN CIRCUIT CHECK

High Voltage Hold Down Circuit Check
(1) Connect test fixture and DC Voltmeter as illustrated (Fig. 14). Be certain test fixture control (VR) is set at minimum (fully counterclockwise).
(2) Apply 120V AC ±3V to receiver (use of variac is recommended). Set Brightness and Picture (contrast) controls to maximum (fully clockwise).
(3) While observing DC voltmeter slowly rotate test fixture control (VR) clockwise. TV must shut down with DC voltmeter maximum indication of 118.8V DC.

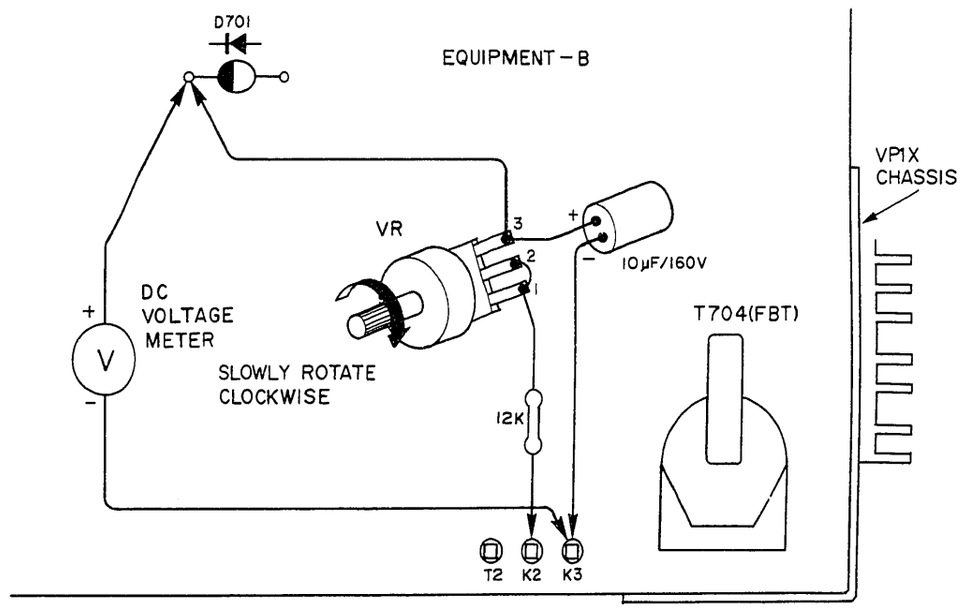


Fig. 14 High Voltage Hold Down Test Fixture and Hook-up

CHASSIS ALIGNMENT

■ Test Equipment

1. Allow minimum of 10 minutes warm-up for test equipment.
2. VHF Sweep Generator-Providing 0-50 MHz VF/IF output–0-12 MHz sweep width and internal marker capability.
3. External Marker Generator – required if Sweep Generator is not equipped with internal markers.
4. Vacuum Tube Voltmeter or Digital Voltmeter – providing a 1.5 V DC Scale.
5. Oscilloscope – Wide band.
6. External Bias – Battery or well regulated, isolated, AC operated variable DC bias supply (0 to 10V).
7. Absorption Type Video Marker Box – Providing 3.03 MHz, 3.58 MHz, 4.08 MHz and 4.5 MHz markers.
8. Sweep Attenuator Pad – See Fig. 15.
9. External Power Supply – capable of supplying +12V DC and a minimum of 500 mA of current.

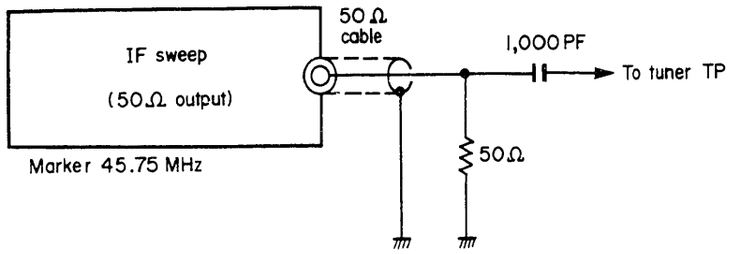


Fig. 15 Sweep Attenuator Pad

■ Preliminary Instructions

1. Apply +12V DC to Control/IF circuit board.
2. Apply approximately +8.6V DC bias to IC 201 pin 12.
3. Connect oscilloscope via direct probe to Control/IF circuit board TP 12.
4. Connect Sweep Generator I-F output with 45.75 MHz marker via sweep attenuator pad (Fig. 15) to tuner Test Point. Adjust sweep output for usable waveform. Adjust L206 for maximum deflection of 45.75 MHz marker (Fig. 16).

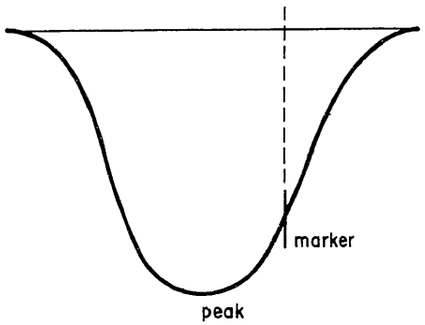


Fig. 16 45.75 MHz Maximum Defl.

5. Increase sweep generator output to obtain saturated waveform (Fig. 17).

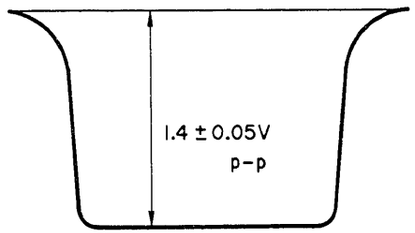


Fig. 17 Saturated Waveform

6. Adjust output level control, R223, to obtain approximately 1.4 volt p-p output (Fig. 17).
7. Remove 45.75 MHz marker and apply 47.25 MHz marker.
8. Connect 56 ohm resistor between pins 18 and 19 of IC 201.
9. Reduce sweep generator output to produce usable waveform.
10. Adjust L204 for minimum deflection of 47.25 MHz marker (Fig. 18).

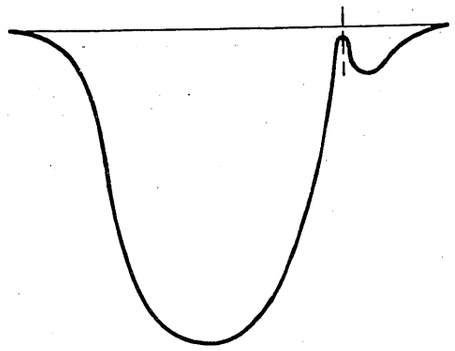


Fig. 18 47.25 MHz Trap

1. AFC

(1) Remove 47.25 MHz marker apply 45.75 MHz marker.
(2) Remove oscilloscope from TP 12.
(3) Apply +6V DC to anode of diode D252.
(4) Connect positive lead of VTVM to IC 201 pin 16 and negative lead to ground.
(5) Adjust L207 for 6.5V DC indication.

Note: During adjustment of L207 a point is encountered where a rapid change in voltage from 0.5V to 11.5V will occur. It is within this rapid change range that L207 should be adjusted to produce the required 6.5V DC indication.

2. Sound I-F (Quadrature Coil)

(1) Tune in local TV channel.
(2) Adjust L405 (quadrature coil) for maximum undistorted sound.

3. TV Audio Level Adjust

Note: TV audio level adjust control, R420, is factory preset and should require no further adjustment.

(1) Tune in local TV channel.
(2) Connect VTVM positive lead to wiper arm of Audio Level Adjust Control, R420.
(3) Adjust R420 to produce approximately 390 to 400 mV RMS output.

4. Audio Balance Adjust

Adjust Audio Balance Control, R435, for equal audio output left and right speakers, i.e., with mono sound output audio should produce effect of coming from center of instrument.

5. Comb Filter Adjust

(1) Receive local channel color signal.
(2) Connect oscilloscope via direct probe to emitter of Q359.
(3) Adjust R367 for minimum color burst (Fig. 19).
(4) Adjust L353 for minimum color burst (Fig. 19).

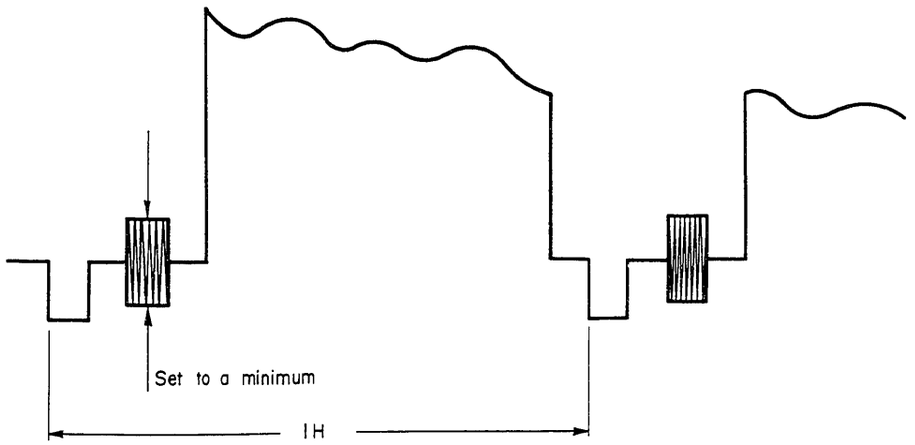


Fig. 19 Comb Filter Adj.

6. Chroma Bandpass Adjust

(1) Test equipment hook-up same as for Picture I-F Alignment except connect absorption type video marker providing 3.08 MHz, 3.58 MHz, and 4.08 MHz markers.

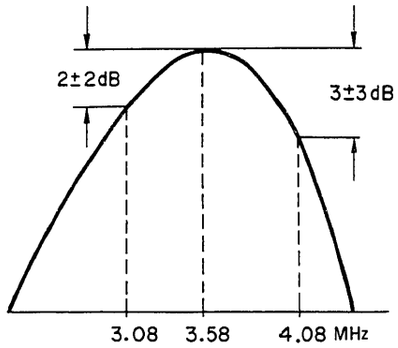


Fig. 20 Bandpass Filter

(2) Connect oscilloscope via direct probe to TP 41.
(3) Adjust output of sweep generator to produce 1V p-p waveform on oscilloscope (Fig. 20).
(4) Adjust T501 for maximum deflection of 3.58 MHz marker and proper positioning of 3.08 MHz 4.08 MHz markers (Fig. 20).

Note: Proper alignment is achieved using indication obtianed with core of T501 closest to bottom of coil form.

7. AFPC (Color Sync Adjust)

(1) Apply color bar signal and place AFC switch in "ON" position.
(2) Connect 27K ohm resistor between IC 501 pin 10 and ground.
(3) Connect IC 501 pin 27 to ground, use short clip lead.
(4) Preset Contrast (picture), Color and Tint controls to their mechanical center positions.
(5) Using insulated alignment tool adjust C519 for stable or slowly floating color bars.
(6) Remove 27K ohm resistor and short clip lead from IC 501 pins 10 and 27.
(7) Check for normal operation by switching on and off channel.

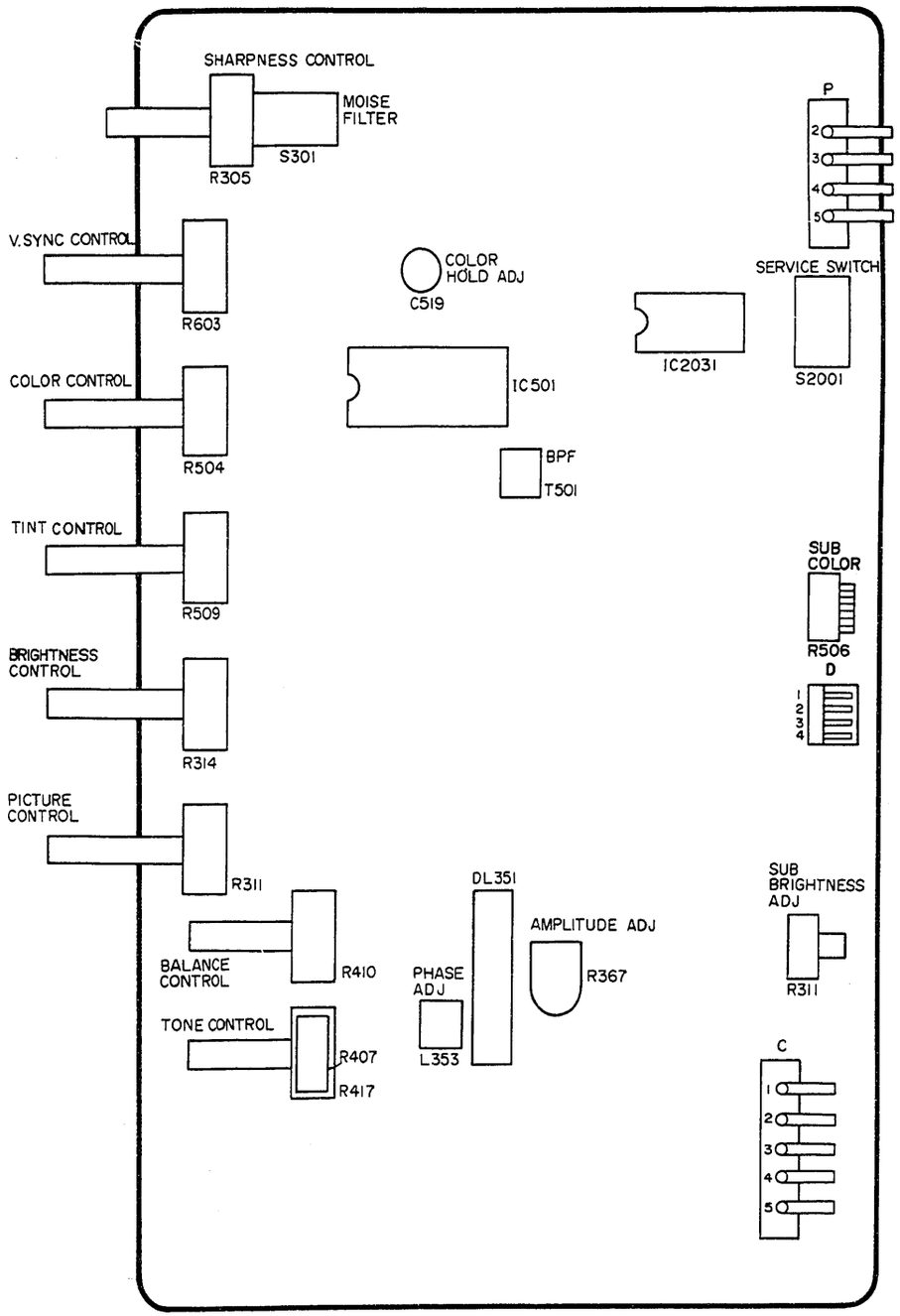


Fig. 21 Signal Circuit Board Alignment Points

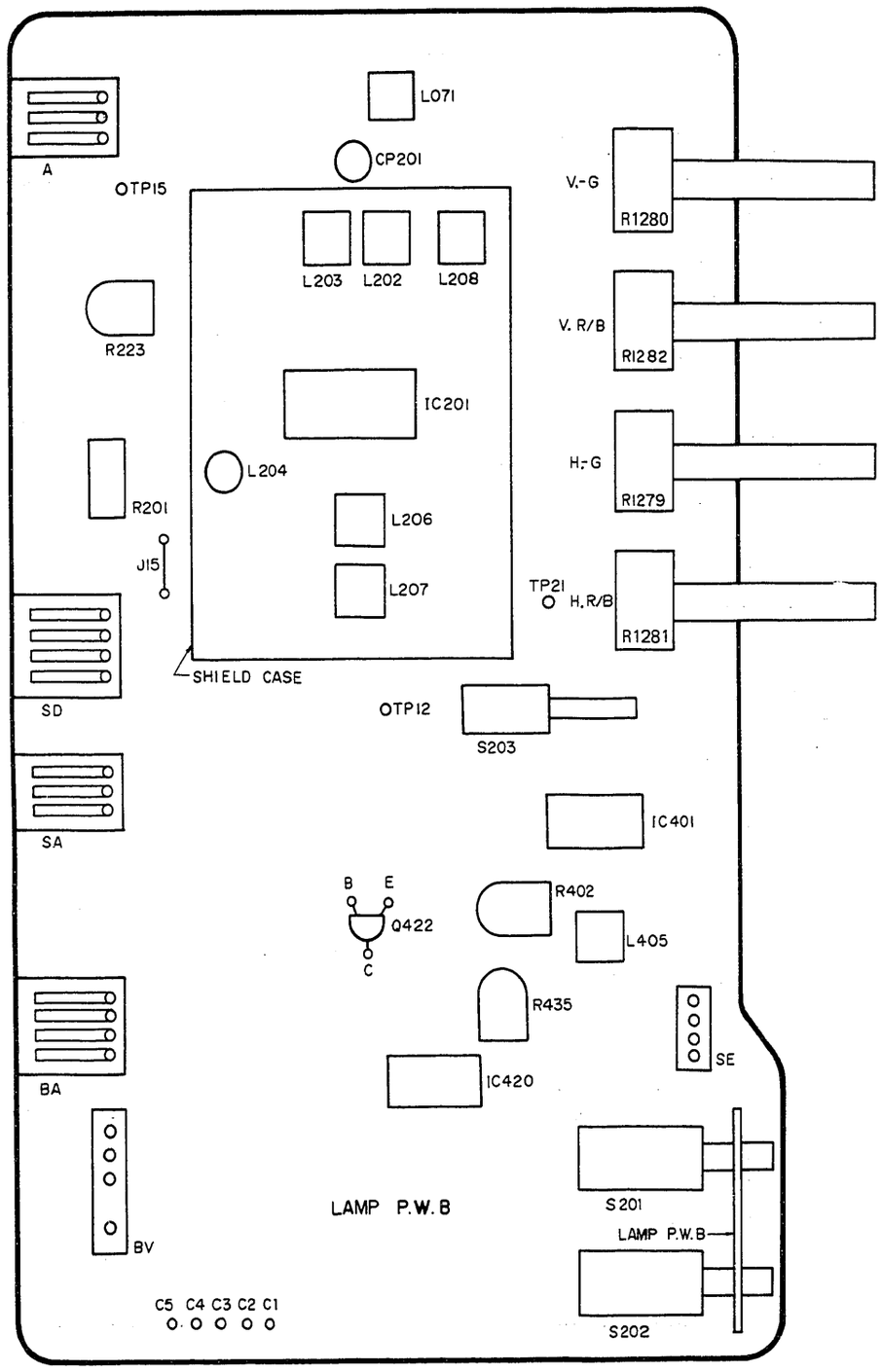


Fig. 22 Control I-F Circuit Board Alignment Points.

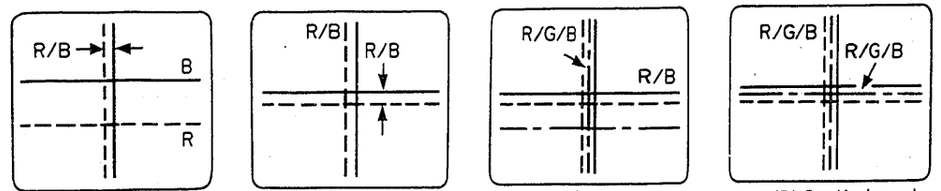
CONVERGENCE ADJUSTMENT

1. Static Convergence Adjustment

Instrument should be operated a minimum of 10 minutes prior to making convergence adjustments.

PROCEDURES:

(1) Cover G (green) lens and project only red and blue on screen.
(2) Turn the R/B horizontal control (R1281), on the customer control panel, to converge the red/blue vertical lines at the center of the screen Fig. 23A.
(3) Turn the R/B vertical control (R1282), on customer control panel, to converge the red/blue horizontal lines at the center of the screen (Fig. 23B).
(4) Remove cover from G (green) lens and project all 3 colors on the screen.
(5) Turn the G horizontal control (R1279), on customer control panel, and converge the green vertical line at the center of the SCREEN to the red/blue vertical lines (Fig. 23C).
(6) Turn the G vertical control (R1280), on customer control panel, and converge the G horizontal line to the center of the red/blue horizontal lines (Fig. 23D)
(7) Repeat Steps 1 through 6b to obtain best static center convergence.



(A) R/B – Vertical Lines Center
(B) R/B – Horizontal Lines Center
(C) G – Vertical Lines Center
(D) G – Horizontal Lines Center

Fig. 23 Static Convergence

2. Red/Blue Dynamic Convergence

Instrument should be operated a minimum of 10 minutes prior to performing dynamic convergence adjustments.
Perform Deflcetion Yoke tilt, picture centering and static convergence adjustments prior to Dynamic Convergence adjustments.
Tune in an active channel and place Test Pattern switch (on control panel) in "ON" position.
Remove instrument top cover.
Cover G (green) lens and project Red and Blue Crosshatch pattern on screen.
Remove Dynamic Convergence panel and position it in front of mirror panel.

(1) Adjust R/B Vertical Bow Control (R1183) for straight R/B Horizontal Centerline left and right side.
(2) Alternately adjust R/B horizontal size (R1191) and R/B Horizontal Linearity (R1182) Controls for evenly spaced vertical lines left to right sides.
(3) Alternately adjust R/B Vertical size (R1136) and R/B Vertical Linearity (R1157) controls for evenly spaced horizontal lines top to bottom.
(4) Alternately adjust R/B Horizontal Skew (R1137) and R/B Horizontal Bow (R1158) controls for straight vertical centerline top and bottom.
(5) Adjust R/B horizontal keystone (R1141) control for straight vertical lines top, bottom, left and right sides (four corners).
(6) Adjust R/B vertical keystone (R1121) control for straight horizontal lines top, bottom, left and right sides (four corners).
(7) Repeat above steps, as necessary, for best overall R/B Dynamic Convergence.

3. Green Dynamic Convergence

Uncover green lens and project all three colors on the screen.

(1) Adjust G Vertical Bow (R1181) control for straight Horizontal centerline left and right sides, superimposed (converged) on R/B Horizontal Centerline left and right sides.
(2) Alternately adjust G Horizontal Size (R1190) and G Horizontal Linearity (R1180) controls for evenly spaced Vertical lines from left to right, superimposed (converged) on R/B Vertical lines.
(3) Alternately adjust G Vertical Size (R1138) and G Vertical Linearity (R1159) controls for evenly spaced Horizontal lines top to bottom, superimposed (converged) on R/B Horizontal lines.
(4) Alternately adjust G Horizontal Skew (R1139) and G Horizontal Bow (R1160) controls for straight Vertical Centerline Top and Bottom superimposed (converged) on R/B vertical Centerline Top and Bottom.
(5) Adjust G Horizontal Keystone (R1255) Control for straight Vertical lines Top and Bottom left and right sides (four corners) superimposed (coverged) on R/B Vertical lines top, bottom, left and right sides (four courners).
(6) Adjust G Vertical Keystone (R1120) control for straight Horizontal lines top, bottom, left and right sides (four corners).
(7) Repeat preceding steps, as necessary, for best overall convergence (G to R/B).

Note: Touch up R/B dynamic convergence and G dynamic convergence adjustments, as necessary, to achieve best overall convergence. Mount convergence panel back in place inside cabinet and properly redress cable in wire ties. Replace cabinet top.

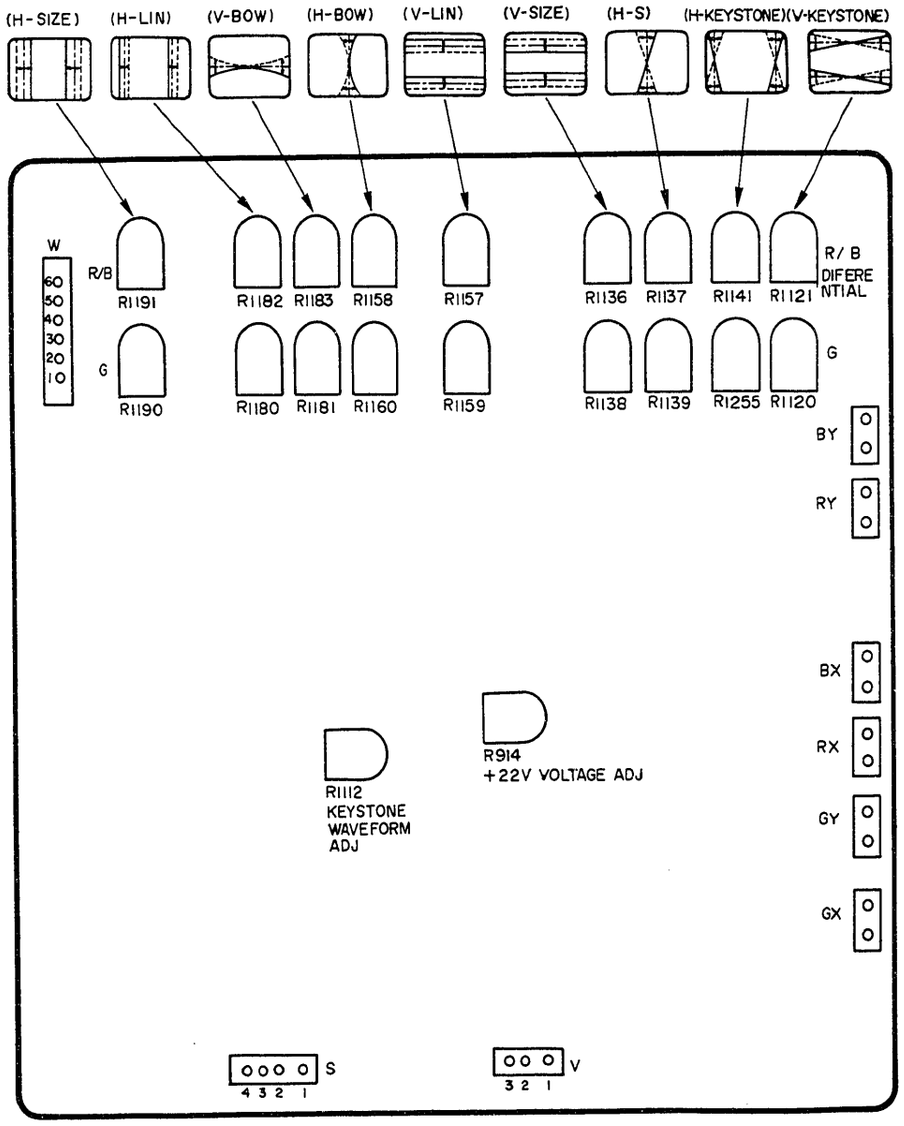


Fig. 24 Convergence Circuit Board Layout.

TROUBLE SHOOTING GUIDE

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1. NO RASTER AND NO SOUND
2. PICTURE IS DARK.
3. ONLY RASTER OR FLYBACK RETRACE APPEARENCE ON SCREEEN
4. NO SYNCHORONZATION
5. NO VERTICAL DEFLECTION
6. VERTICAL DEFLECTION SIZE DEFECTIVE
7. PICTURE BOW-DISTORTED (VERTICALY)
8. PICTURE KEYSTONE-DISTORTED (HORIZONTALY)
9. NO COLOR
10. WHITE BALANCE/TINT DEFECTIVE
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12. NO SOUND OR VOLUME NOT VARIABLE
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14. PICTURE TOO LARGE
15. NO CHANNEL SELECT OPERATION
16. NO OPERATION BY REMOTE CONTROL
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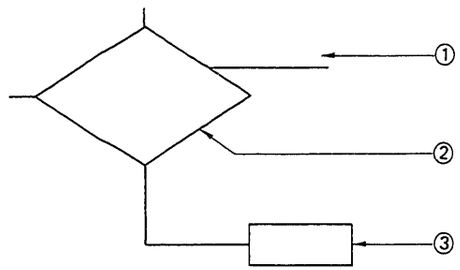
    (2) NO OPERATION



① This shows the name of the printed circuit board to be checked.

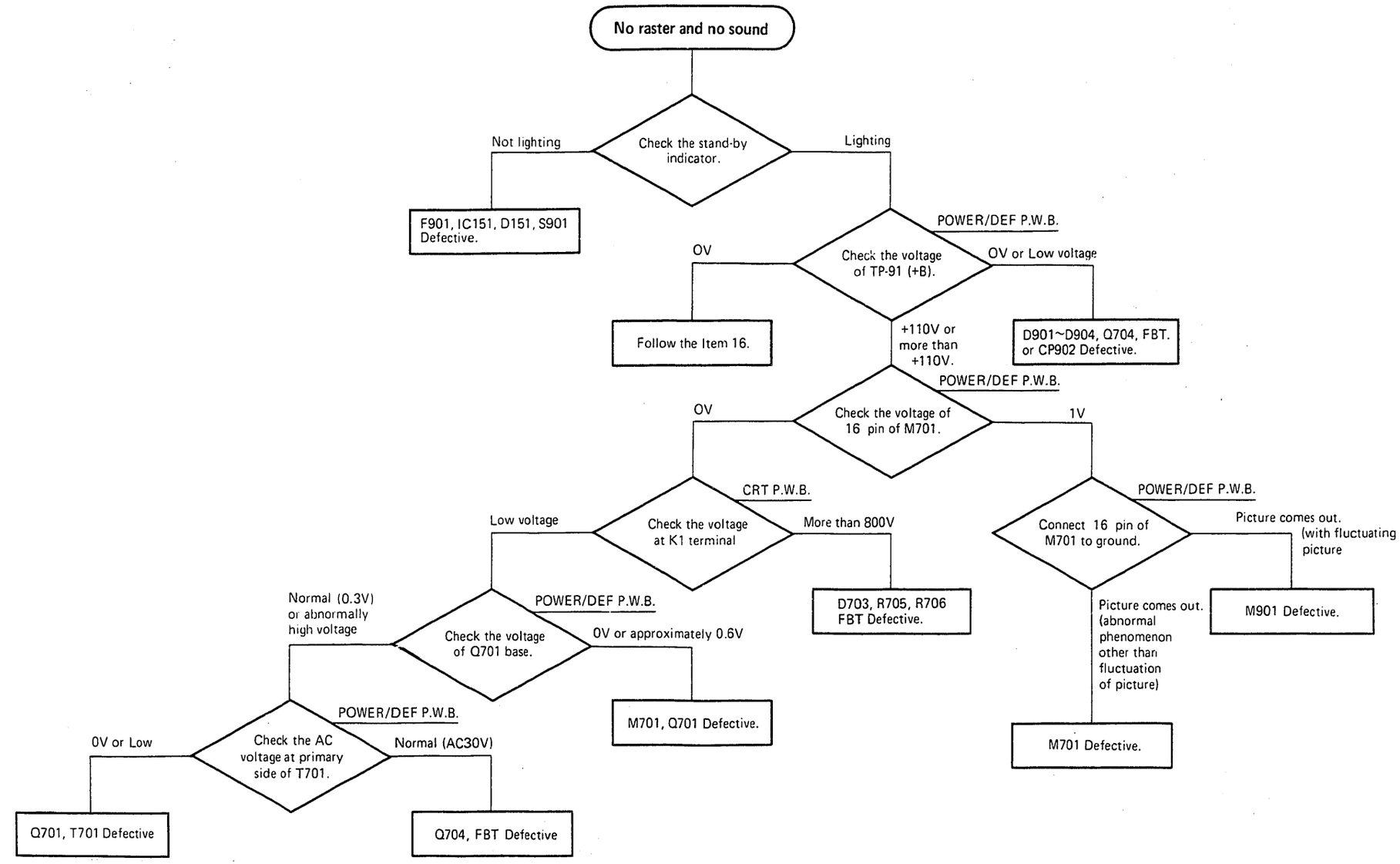
② This shows the point to be checked.

③ This shows the name of the faulty circuit and main parts to be checked.

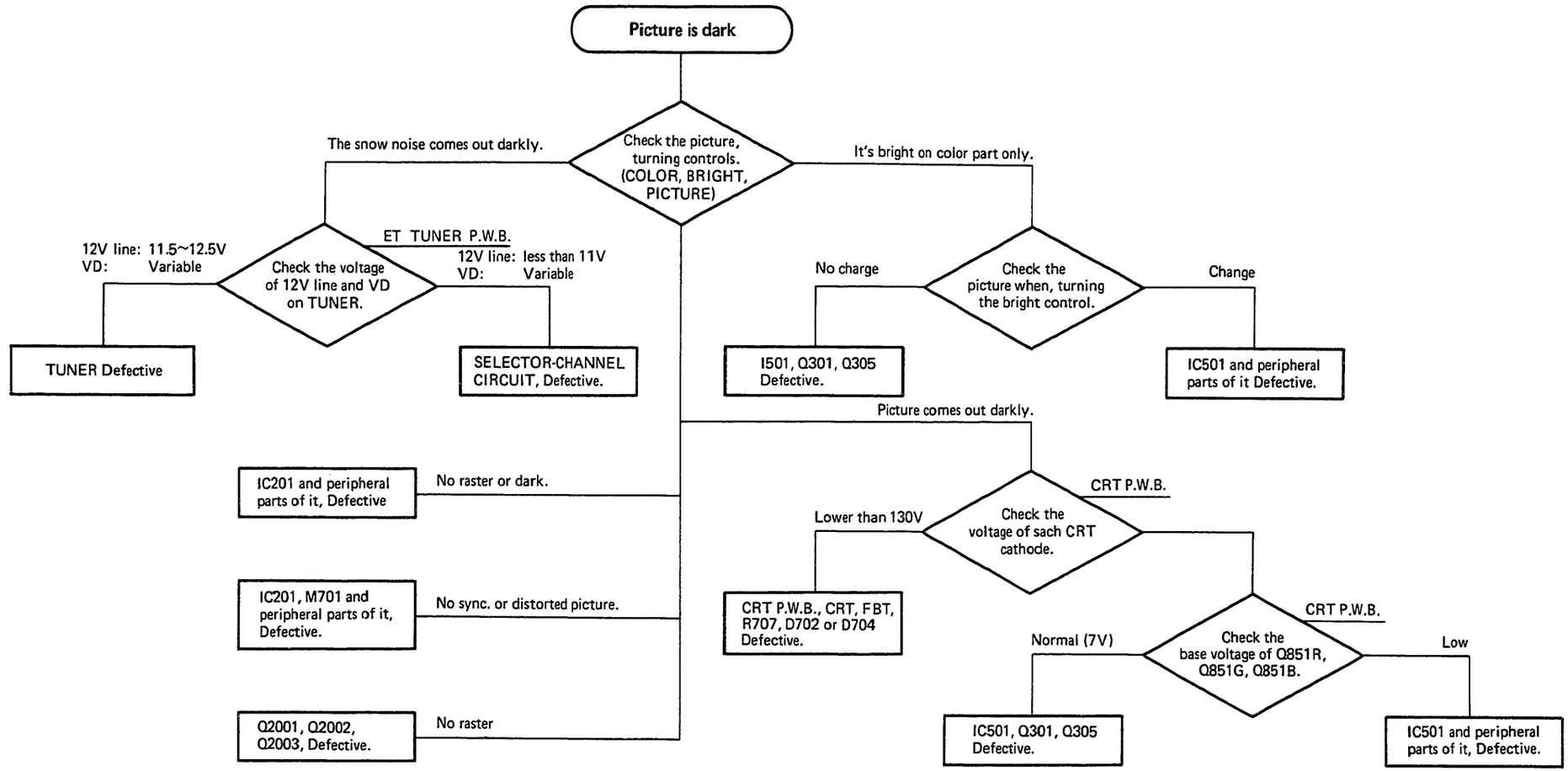
0. CHECK HERE BEFORE CALLING FOR SERVICE

CHECK THESE ITEMS AND TRY THESE ADJUSTMENT / SYMTOMS	No picture, no sound	Sound OK, poor picture	Picture OK, poor sound	Picture blurred	Lines or streaks in picture	Poor reception several channels	Picture rolls vertically	No color	Poor color	Cross-hached pattarn only
Be sure power cord is plugged in	o									
Be sure TV is switched "ON"	o									
Try another channel (station trouble)	o	o	o	o	o	o	o	o	o	
Check antenna connections (back of TV)	o	o	o	o	o	o		o	o	
Check antenna for broken lead-in wire	o	o	o	o	o	o		o	o	
Check outside antenna	o	o	o	o	o	o		o	o	
Check for local interference		o	o	o	o	o	o			
Adjust Fine Tuning	o	o	o	o	o	o		o	o	
Adjust V-HOLD knob							o			
Adjust PICTURE knob		o								
Adjust BRIGHTNESS knob		o								
Adjust COLOR knob								o	o	
Adjust TINT knob									o	
Adjust VOLUME button			o							
Adjust indoor antenna if used		o	o	o	o	o		o	o	
Be sure TEST PATTERN switch OFF in the CONTROL PANEL										o
Check TV/AUX button to the right position	o									
Check aux. VIDEO INPUT source and connections (back of TV)	o	o								
Check aux. AUDIO INPUT source and connections (back of TV)	o		o							
Check the SPEAKER SELECTOR switch to the right position (back of TV)	o		o							

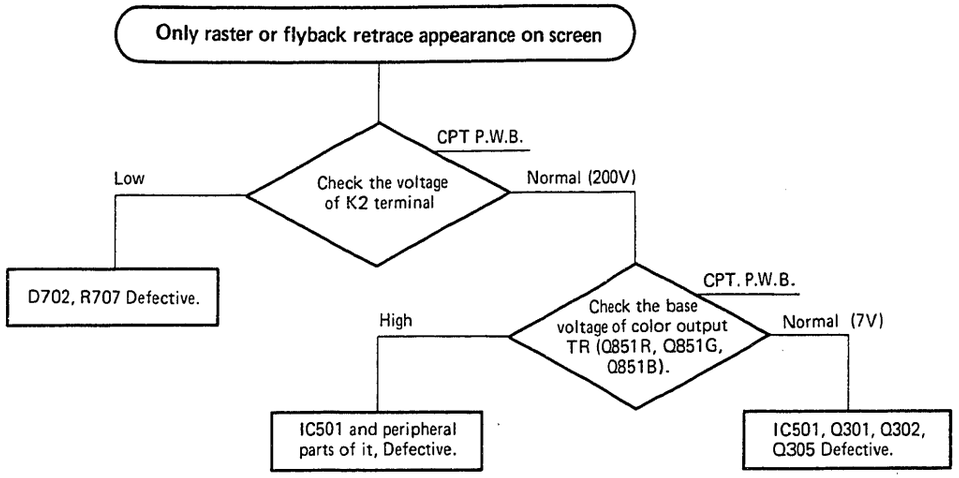
1. NO RASTER AND NO SOUND



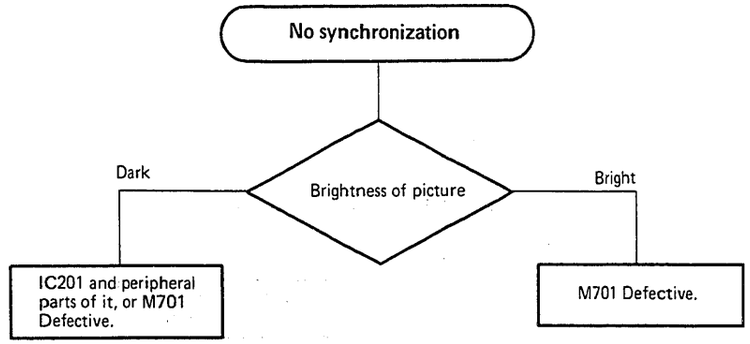
2. PICTURE IS DARK


Picture is dark
Check the picture, turning controls. (COLOR, BRIGHT, PICTURE)
The snow noise comes out darkly.
It's bright on color part only.
ET TUNER P.W.B.
Check the voltage of 12V line and VD on TUNER.
12V line: 11.5~12.5V
VD: Variable
12V line: less than 11V
VD: Variable
TUNER Defective
SELECTOR-CHANNEL CIRCUIT, Defective.
Check the picture when, turning the bright control.
No charge
Change
I501, Q301, Q305 Defective.
IC501 and peripheral parts of it Defective.
Picture comes out darkly.
IC201 and peripheral parts of it, Defective
No raster or dark.
IC201, M701 and peripheral parts of it, Defective.
No sync. or distorted picture.
Q2001, Q2002, Q2003, Defective.
No raster
CRT P.W.B.
Check the voltage of sach CRT cathode.
Lower than 130V
CRT P.W.B., CRT, FBT, R707, D702 or D704 Defective.
CRT P.W.B.
Check the base voltage of Q851R, Q851G, Q851B.
Normal (7V)
Low
IC501, Q301, Q305 Defective.
IC501 and peripheral parts of it, Defective.

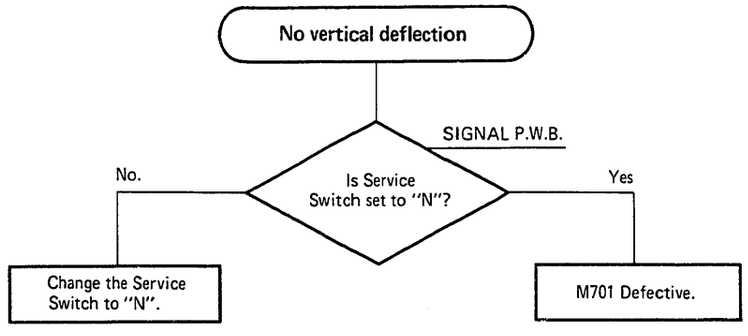
3. ONLY RASTER OR FLYBACK RETRACE APPEARENCE ON SCREEN


Only raster or flyback retrace appearance on screen
CPT P.W.B.
Low
Check the voltage of K2 terminal
Normal (200V)
D702, R707 Defective.
CPT. P.W.B.
High
Check the base voltage of color output TR (Q851R, Q851G, Q851B).
Normal (7V)
IC501 and peripheral parts of it, Defective.
IC501, Q301, Q302, Q305 Defective.

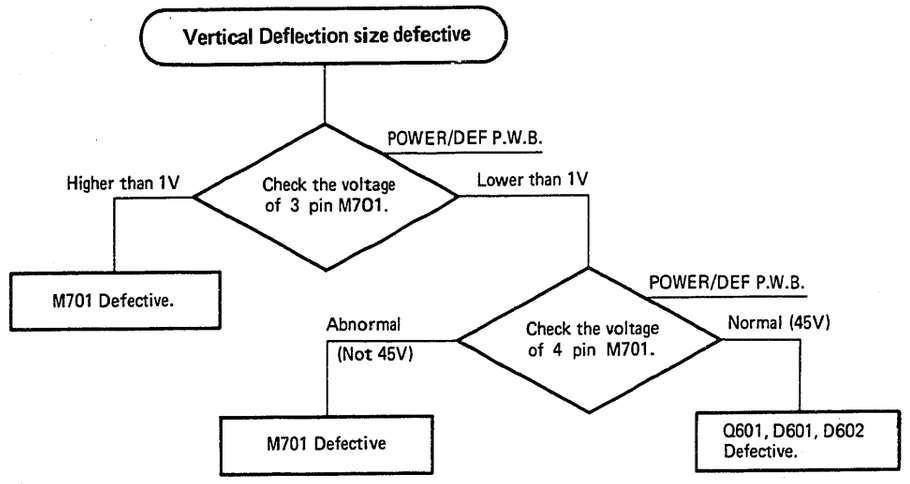
4. NO SYNCHRONIZATION



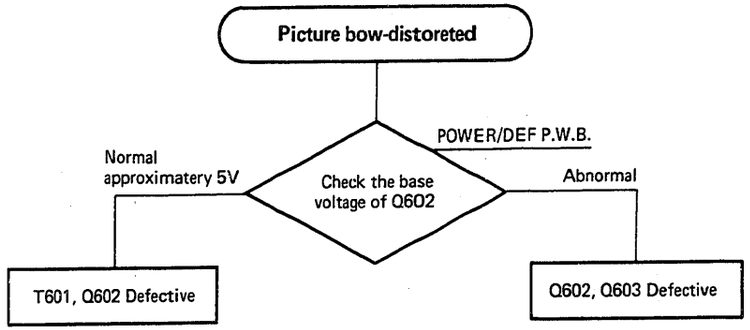
5. NO VERTICAL DEFLECTION



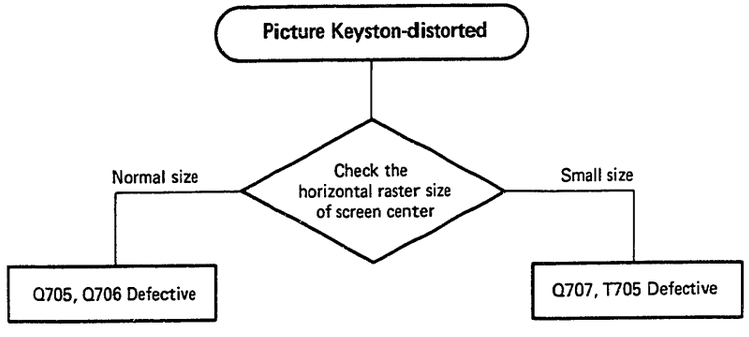
6. VERTICAL DEFLCETION SIZE DEFECTIVE



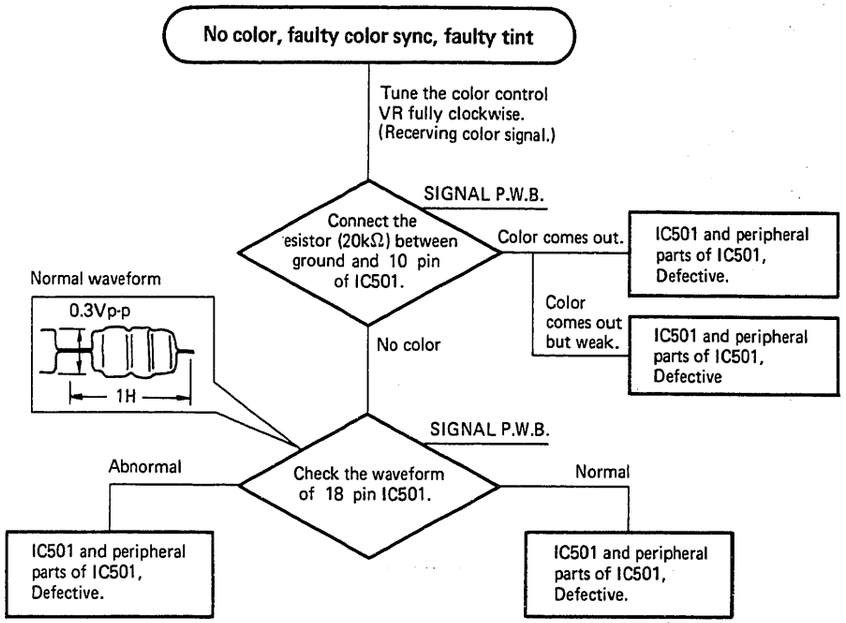
7. PICTURE BOW-DISTORTED (VERTICALY)



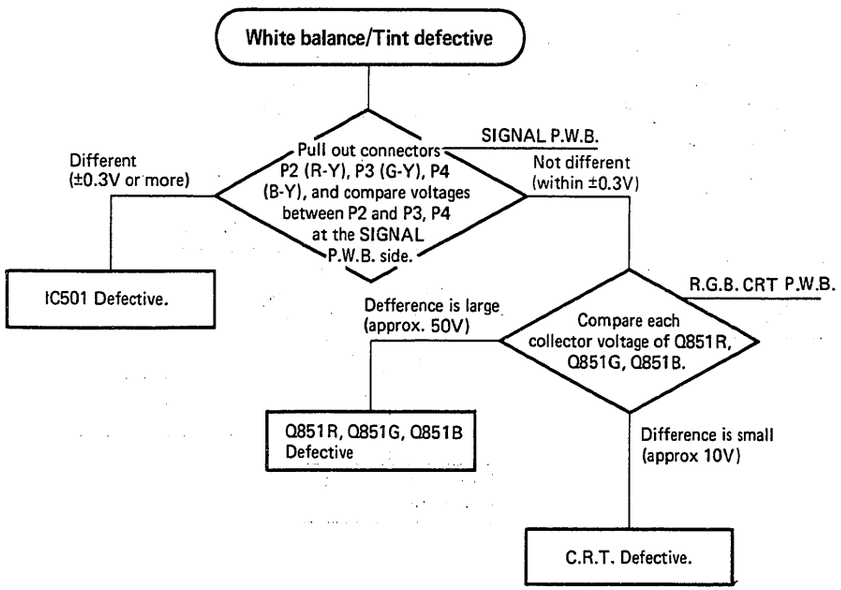
8. PICTURE KEYSTONE-DISTORETED (HORIZONTALY)



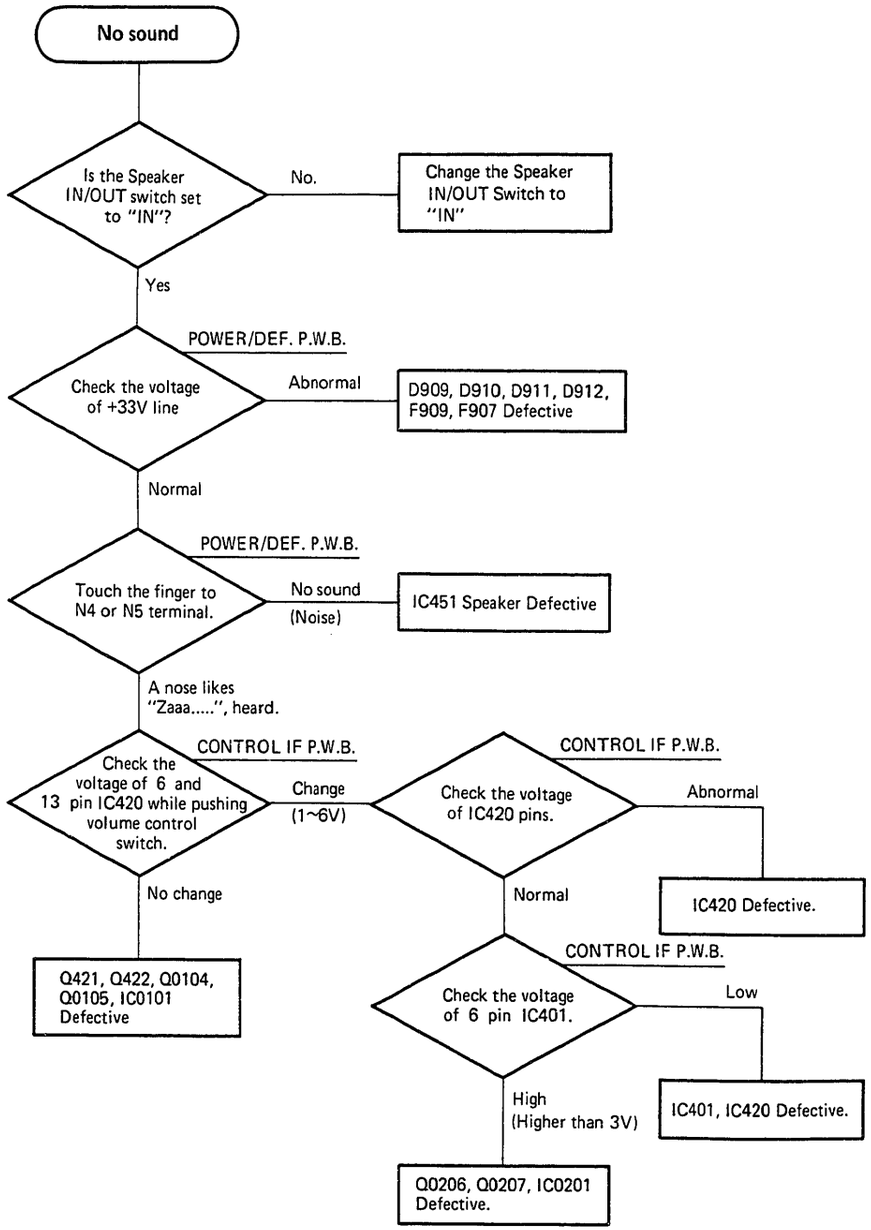
9. NO COLOR, FAULTY COLOR SYNC, FAULTY TINT


No color, faulty color sync, faulty tint
Tune the color control VR fully clockwise. (Recerving color signal.)
SIGNAL P.W.B.
Connect the esistor (20kΩ) between ground and 10 pin of IC501.
Color comes out.
IC501 and peripheral parts of IC501, Defective.
Color comes out but weak.
IC501 and peripheral parts of IC501, Defective
Normal waveform
0.3Vp-p
1H
No color
SIGNAL P.W.B.
Check the waveform of 18 pin IC501.
Abnormal
Normal
IC501 and peripheral parts of IC501, Defective.
IC501 and peripheral parts of IC501, Defective.

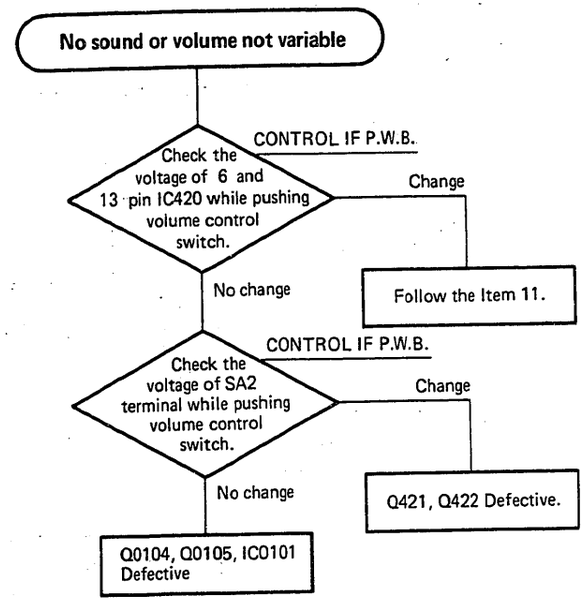
10. WHITE BALANCE/TINT DEFECTIVE


White balance/Tint defective
SIGNAL P.W.B.
Pull out connectors P2 (R-Y), P3 (G-Y), P4 (B-Y), and compare voltages between P2 and P3, P4 at the SIGNAL P.W.B. side.
Different (±0.3V or more)
Not different (within ±0.3V)
IC501 Defective.
R.G.B. CRT P.W.B.
Defference is large (approx. 50V)
Compare each collector voltage of Q851R, Q851G, Q851B.
Q851R, Q851G, Q851B Defective
Difference is small (approx 10V)
C.R.T. Defective.

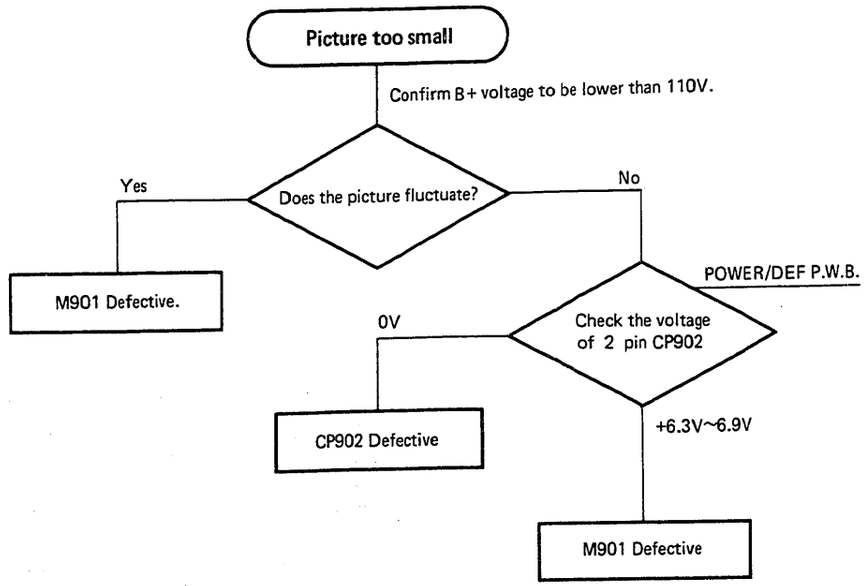
11. NO SOUND



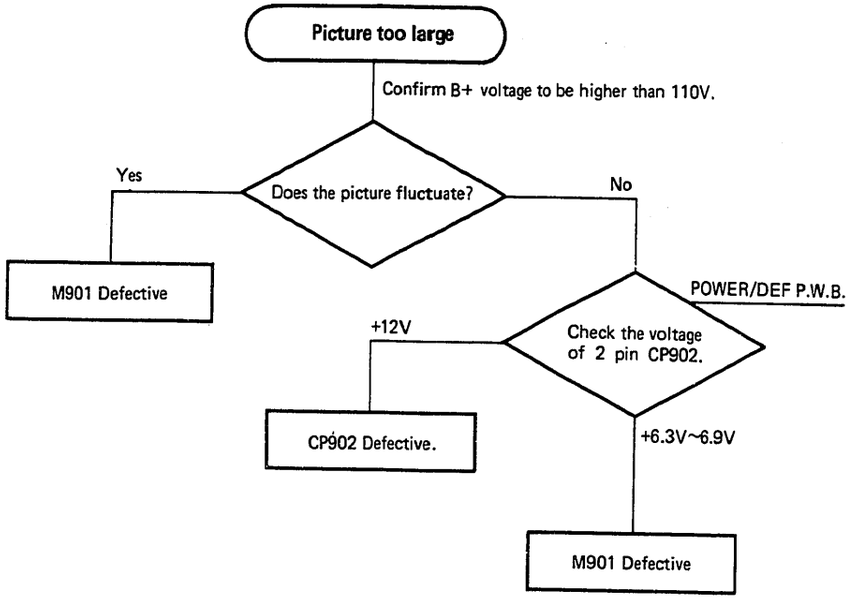
12. NO SOUND OR VOLUME NOT VARIABLE


No sound or volume not variable
CONTROL IF P.W.B.
Check the voltage of 6 and 13 pin IC420 while pushing volume control switch.
Change
Follow the Item 11.
No change
CONTROL IF P.W.B.
Check the voltage of SA2 terminal while pushing volume control switch.
Change
Q421, Q422 Defective.
No change
Q0104, Q0105, IC0101 Defective

13. PICTURE TOO SMALL



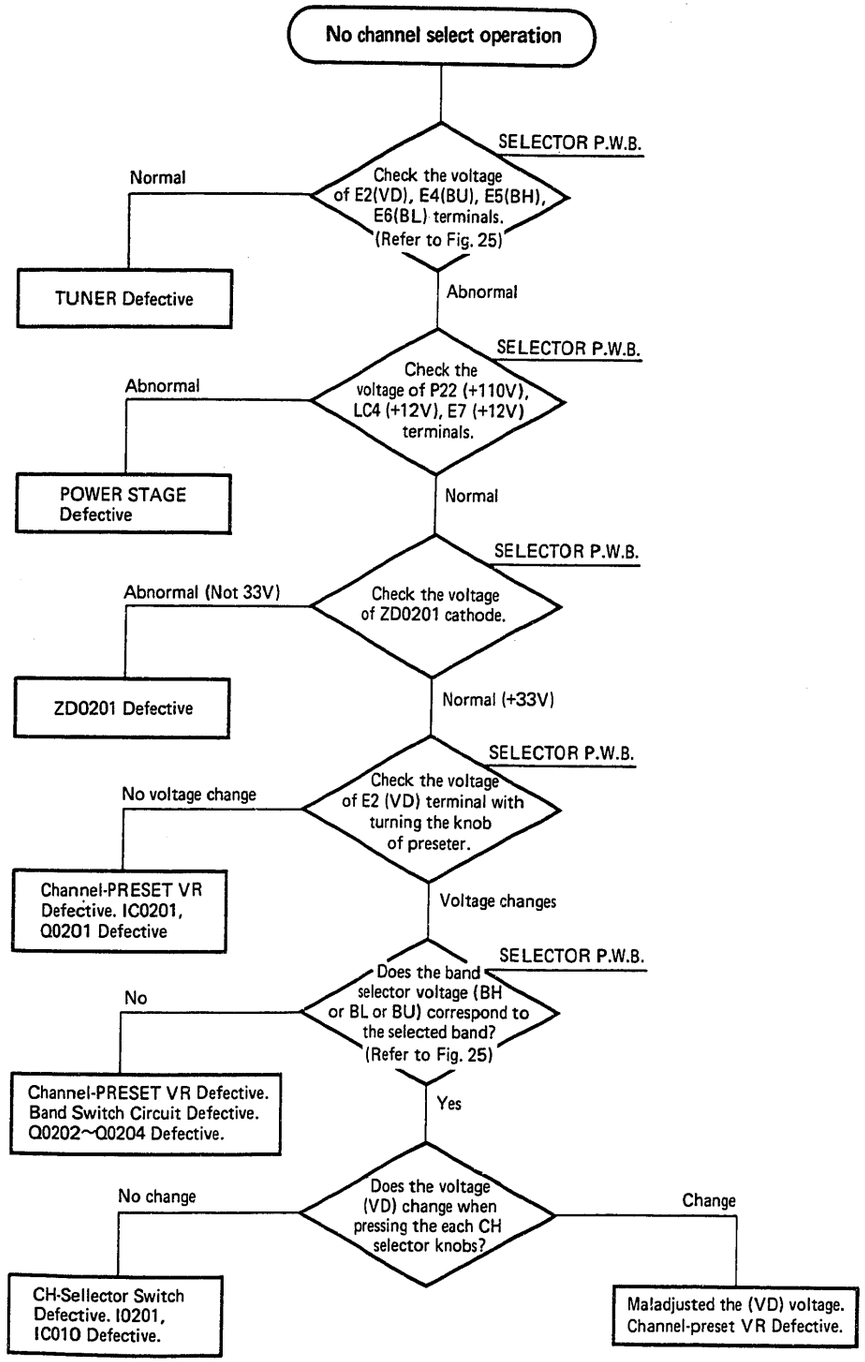
14. PICTURE TOO LARGE



Band / Terminal	VHF Low (2 ~ 6 ch)	VHF High (7 ~ 13 ch)	UHF
E4 (BU)	0V	0V	12V
E5 (BH)	0V	12V	0V
E6 (BL)	12V	0V	0V

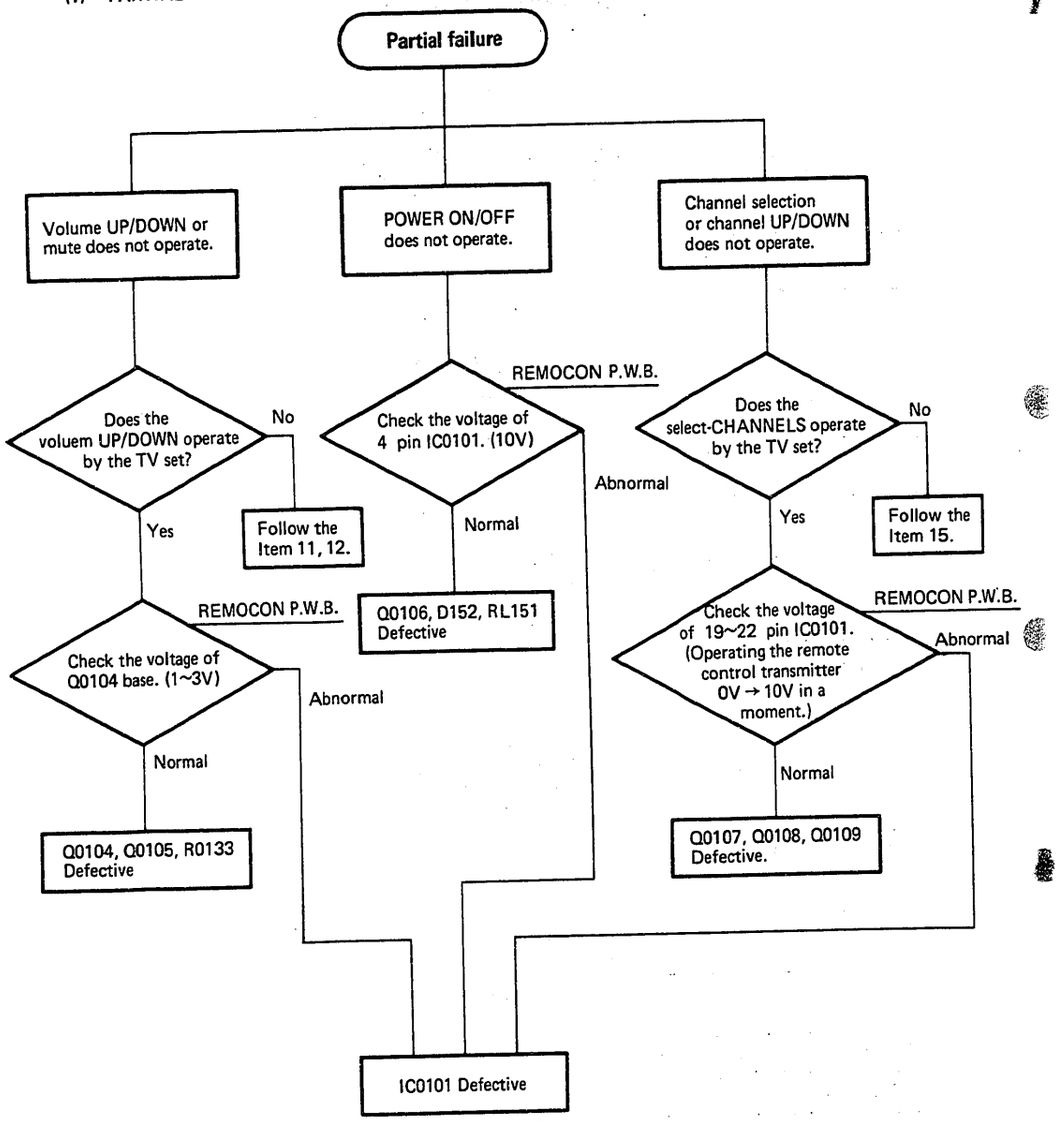
Fig. 25

15. NO CHANNEL SELECT OPERATION

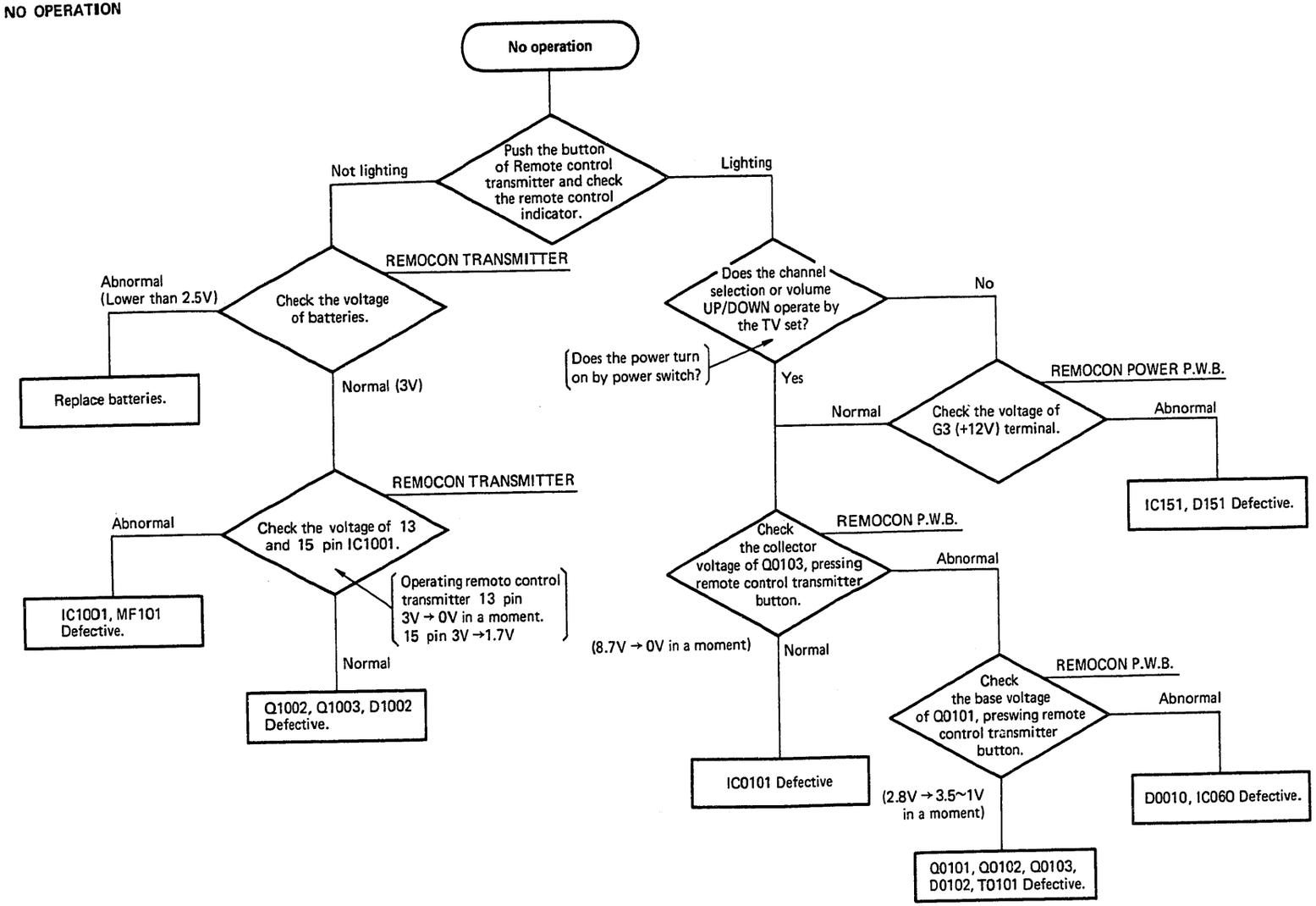

No channel select operation
SELECTOR P.W.B.
Check the voltage of E2(VD), E4(BU), E5(BH), E6(BL) terminals. (Refer to Fig. 25)
Normal
TUNER Defective
Abnormal
SELECTOR P.W.B.
Check the voltage of P22 (+110V), LC4 (+12V), E7 (+12V) terminals.
Abnormal
POWER STAGE Defective
Normal
SELECTOR P.W.B.
Check the voltage of ZD0201 cathode.
Abnormal (Not 33V)
ZD0201 Defective
Normal (+33V)
SELECTOR P.W.B.
Check the voltage of E2 (VD) terminal with turning the knob of preseter.
No voltage change
Channel-PRESET VR Defective. IC0201, Q0201 Defective
Voltage changes
SELECTOR P.W.B.
Does the band selector voltage (BH or BL or BU) correspond to the selected band? (Refer to Fig. 25)
No
Channel-PRESET VR Defective. Band Switch Circuit Defective. Q0202~Q0204 Defective.
Yes
Does the voltage (VD) change when pressing the each CH selector knobs?
No change
CH-Sellector Switch Defective. I0201, IC010 Defective.
Change
Maladjusted the (VD) voltage. Channel-preset VR Defective.

16. NO OPERATION BY REMOTE CONTROL

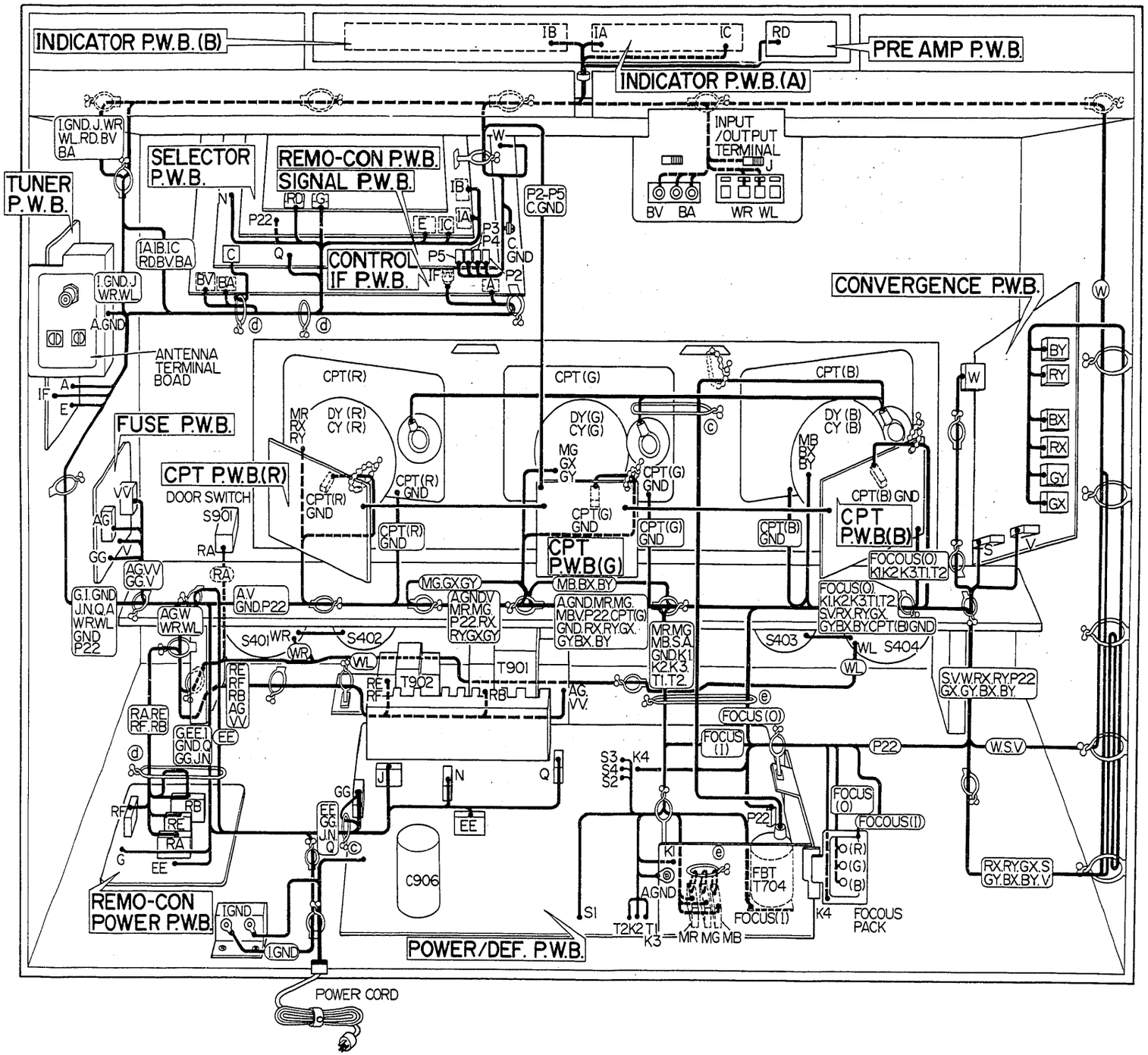
(1) PARTIAL FAILURE


Partial failure
Volume UP/DOWN or mute does not operate.
POWER ON/OFF does not operate.
Channel selection or channel UP/DOWN does not operate.
Does the voluem UP/DOWN operate by the TV set?
No
Yes
Follow the Item 11, 12.
REMOCON P.W.B.
Check the voltage of Q0104 base. (1~3V)
Abnormal
Normal
Q0104, Q0105, R0133 Defective
REMOCON P.W.B.
Check the voltage of 4 pin IC0101. (10V)
Abnormal
Normal
Q0106, D152, RL151 Defective
Does the select-CHANNELS operate by the TV set?
No
Yes
Follow the Item 15.
REMOCON P.W.B.
Check the voltage of 19~22 pin IC0101. (Operating the remote control transmitter 0V → 10V in a moment.)
Abnormal
Normal
Q0107, Q0108, Q0109 Defective.
IC0101 Defective

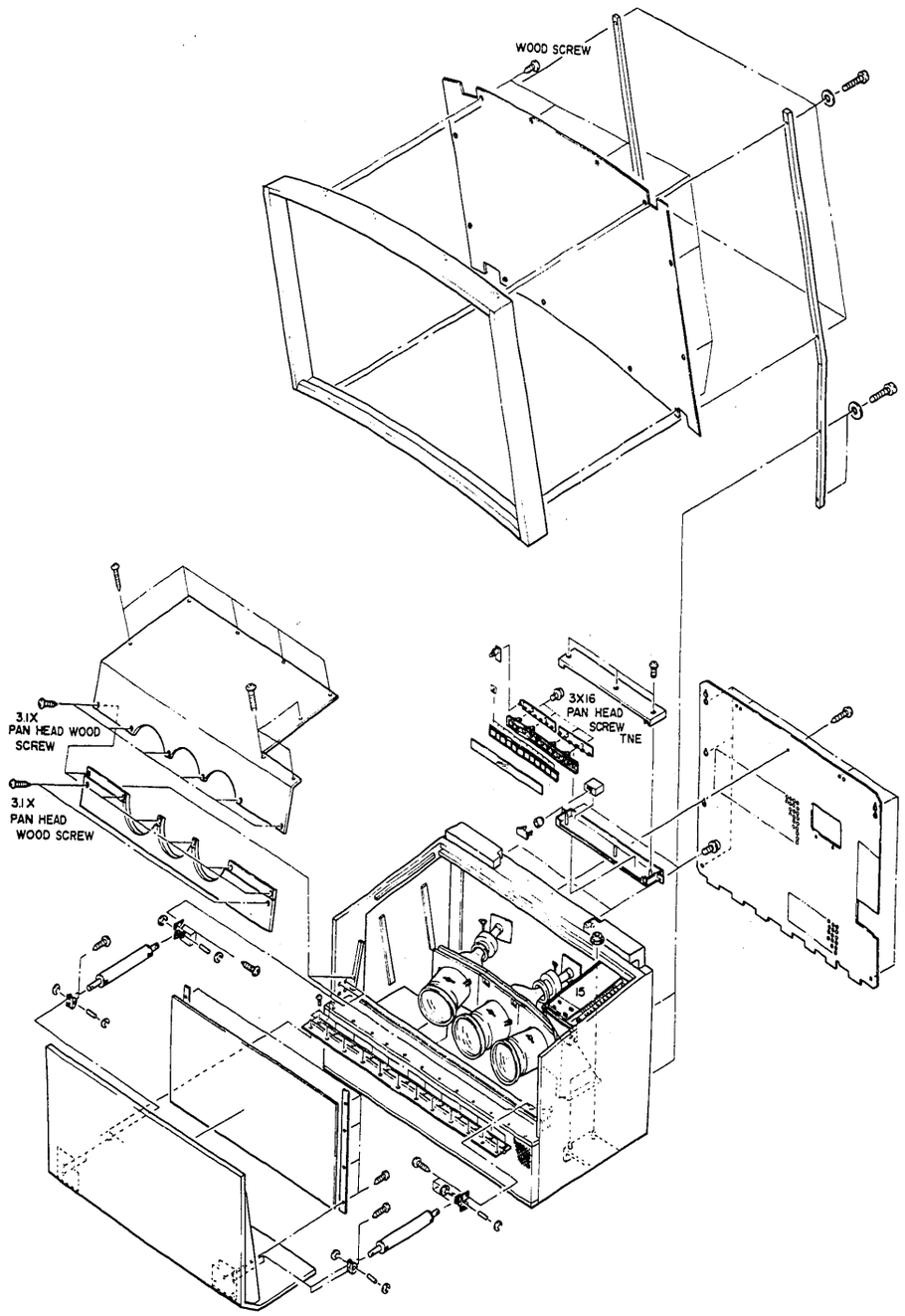
(2) NO OPERATION


No operation
Push the button of Remote control transmitter and check the remote control indicator.
Not lighting
Lighting
REMOCON TRANSMITTER
Abnormal (Lower than 2.5V)
Check the voltage of batteries.
Replace batteries.
Normal (3V)
REMOCON TRANSMITTER
Abnormal
Check the voltage of 13 and 15 pin IC1001.
Operating remoto control transmitter 13 pin 3V → 0V in a moment. 15 pin 3V →1.7V
IC1001, MF101 Defective.
Normal
Q1002, Q1003, D1002 Defective.
Does the channel selection or volume UP/DOWN operate by the TV set?
No
Does the power turn on by power switch?
Yes
REMOCON POWER P.W.B.
Normal
Check the voltage of G3 (+12V) terminal.
Abnormal
IC151, D151 Defective.
REMOCON P.W.B.
Check the collector voltage of Q0103, pressing remote control transmitter button.
Abnormal
(8.7V → 0V in a moment)
Normal
IC0101 Defective
REMOCON P.W.B.
Check the base voltage of Q0101, preswing remote control transmitter button.
Abnormal
D0010, IC060 Defective.
(2.8V → 3.5~1V in a moment)
Q0101, Q0102, Q0103, D0102, T0101 Defective.

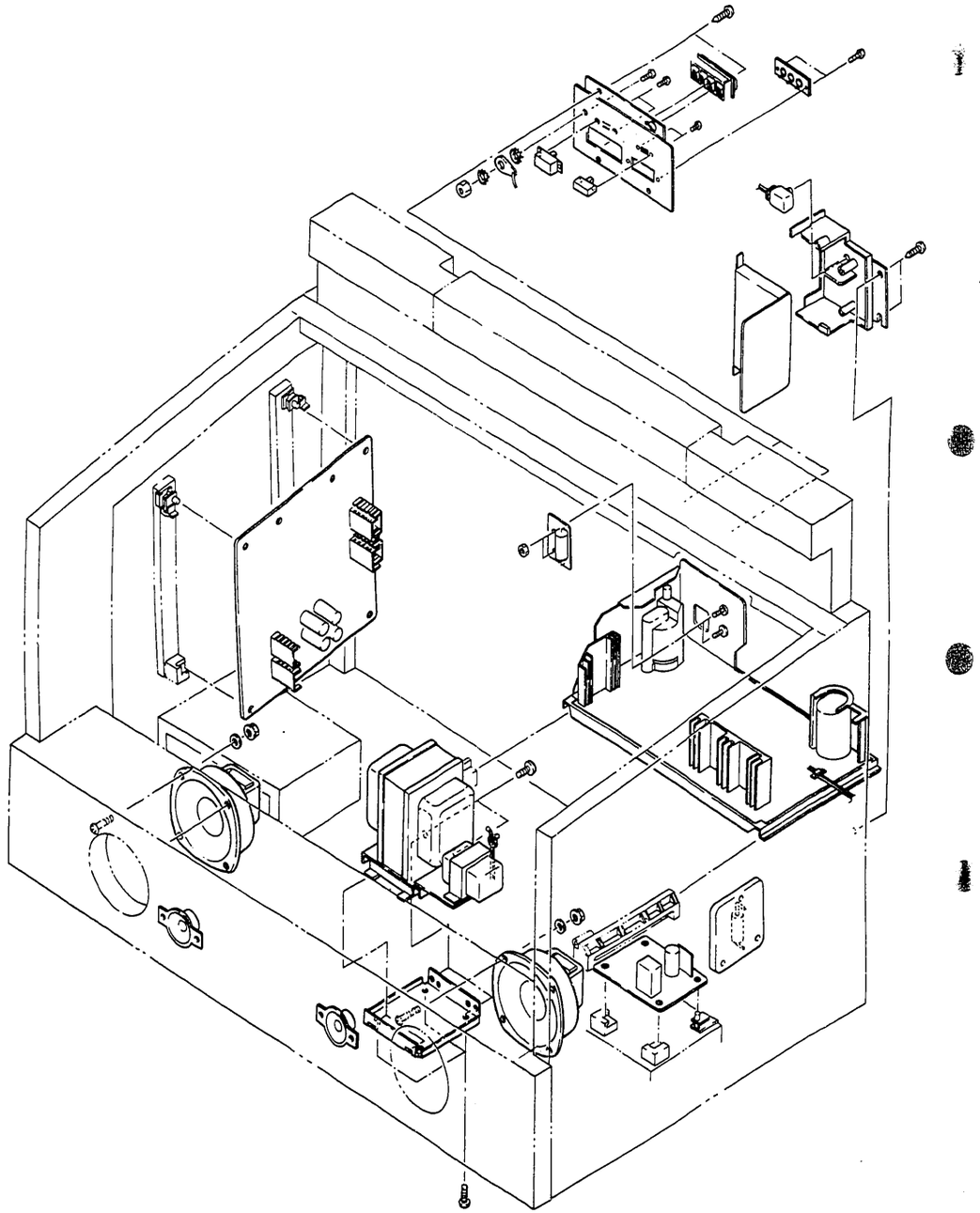
WIRING DIAGRAM



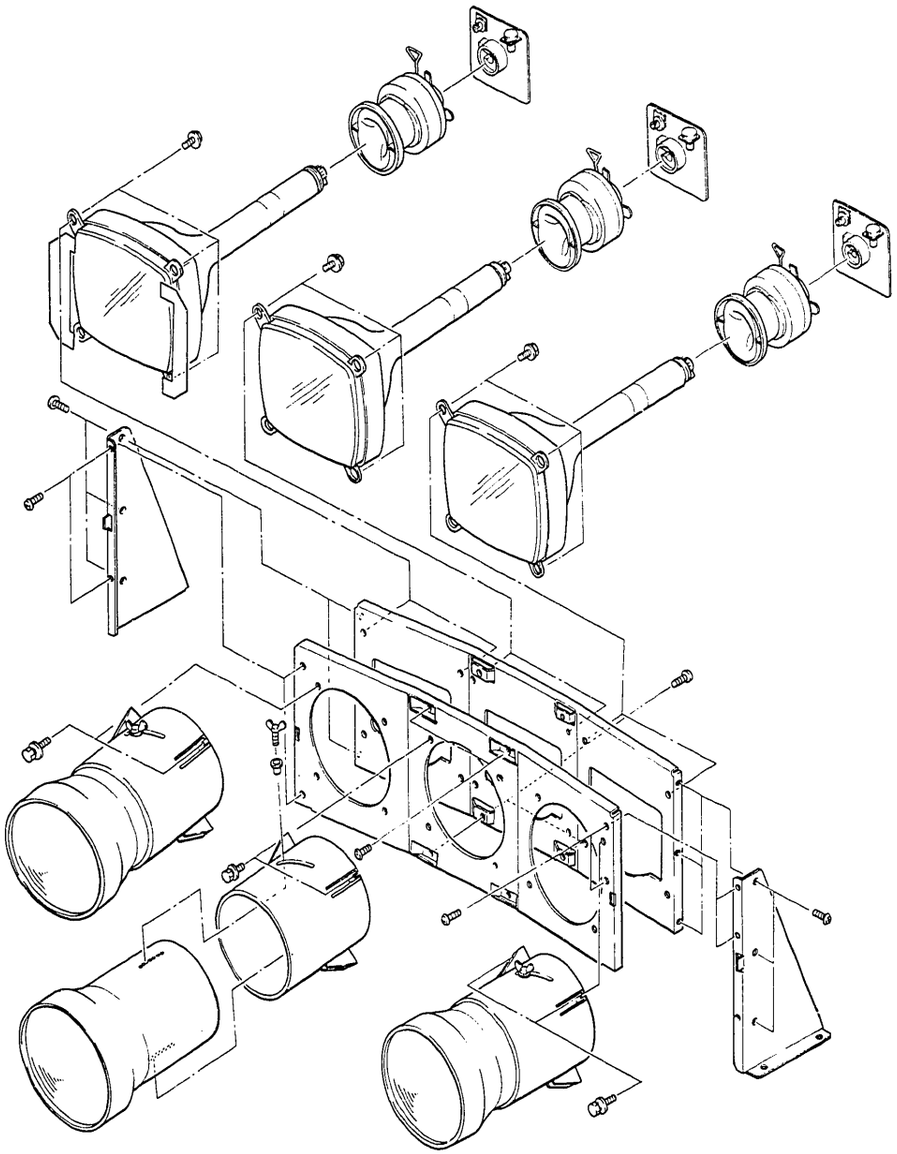
EXPLODED VIEW



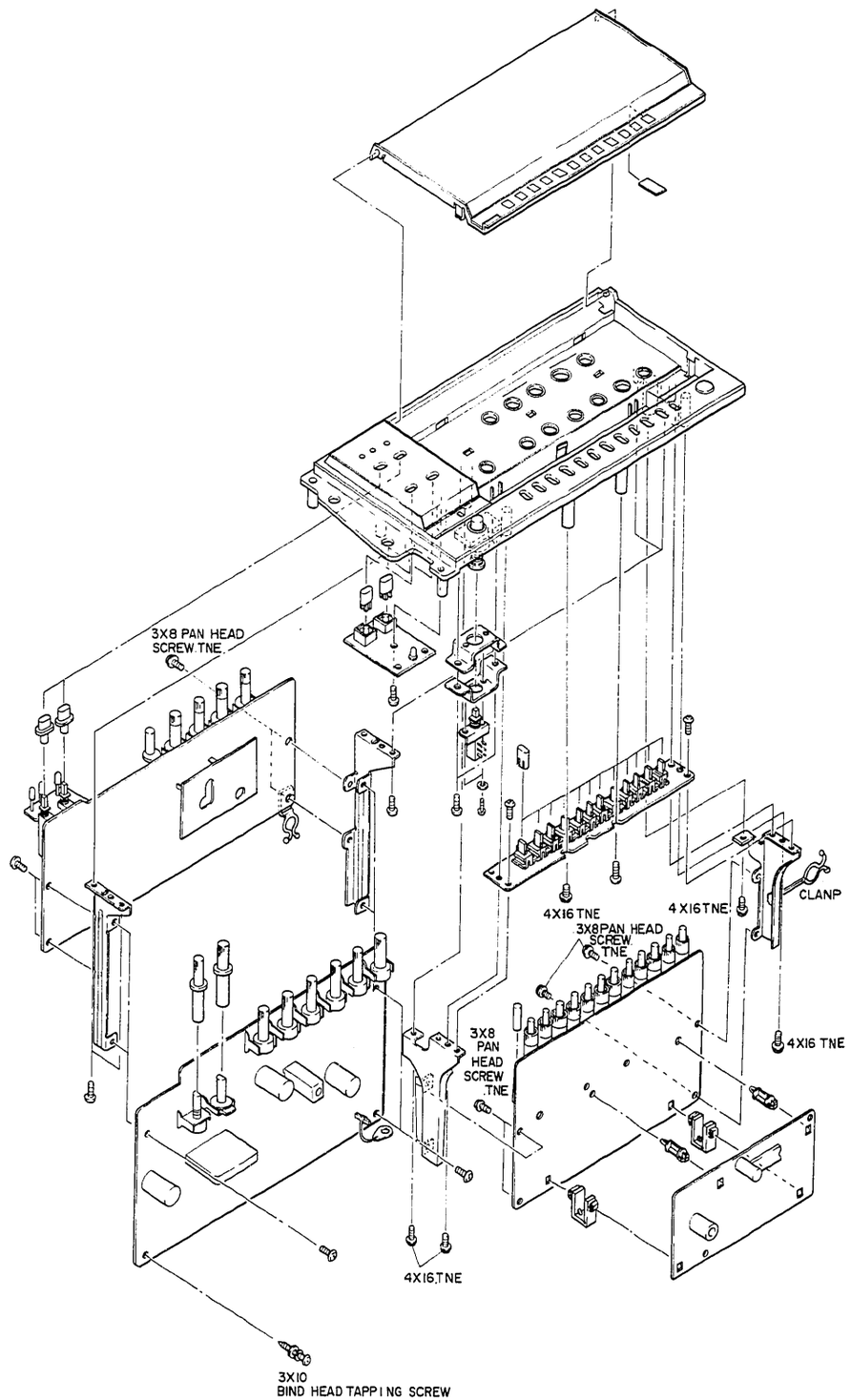
EXPLODED VIEW



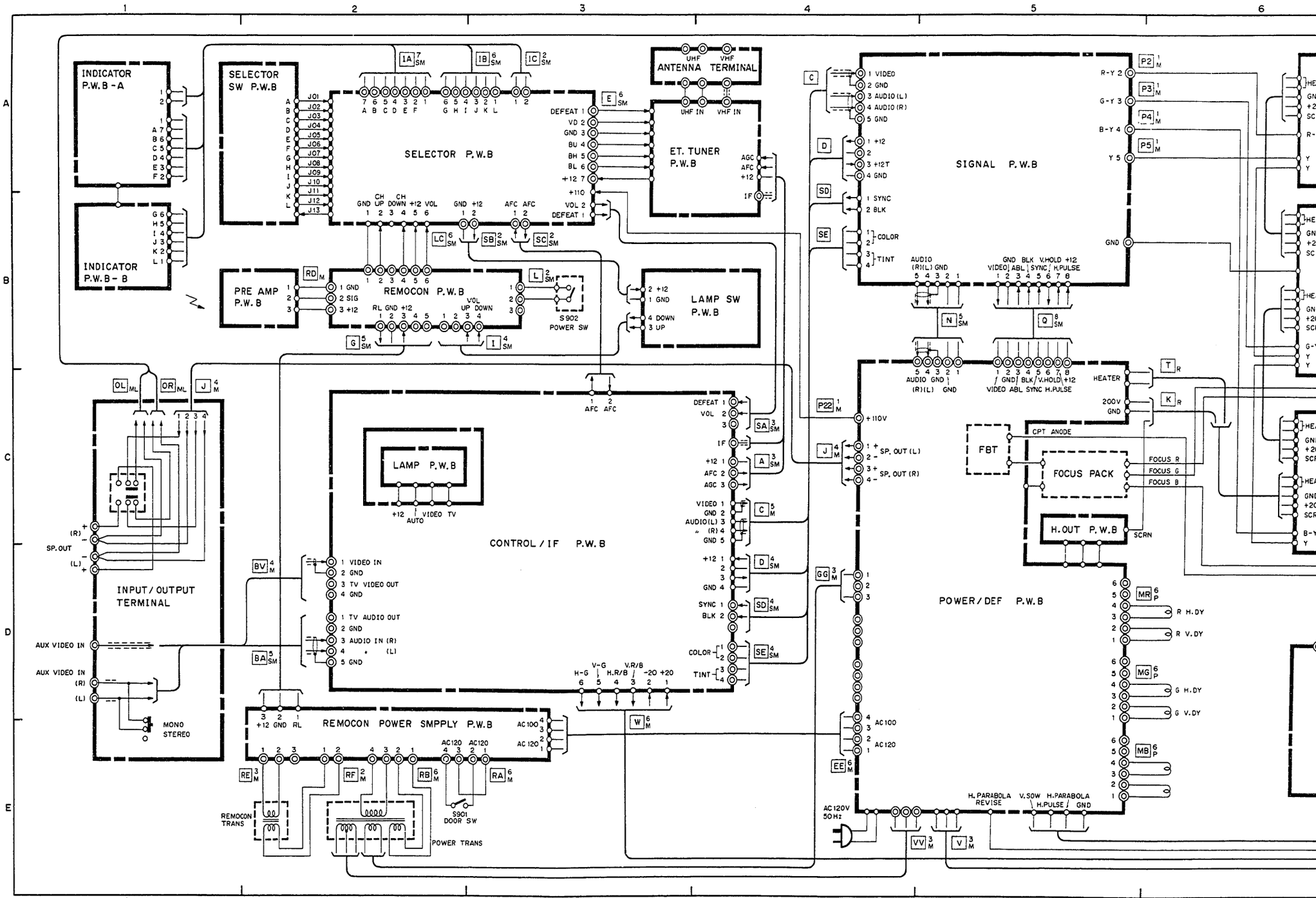
EXPLODED VIEW



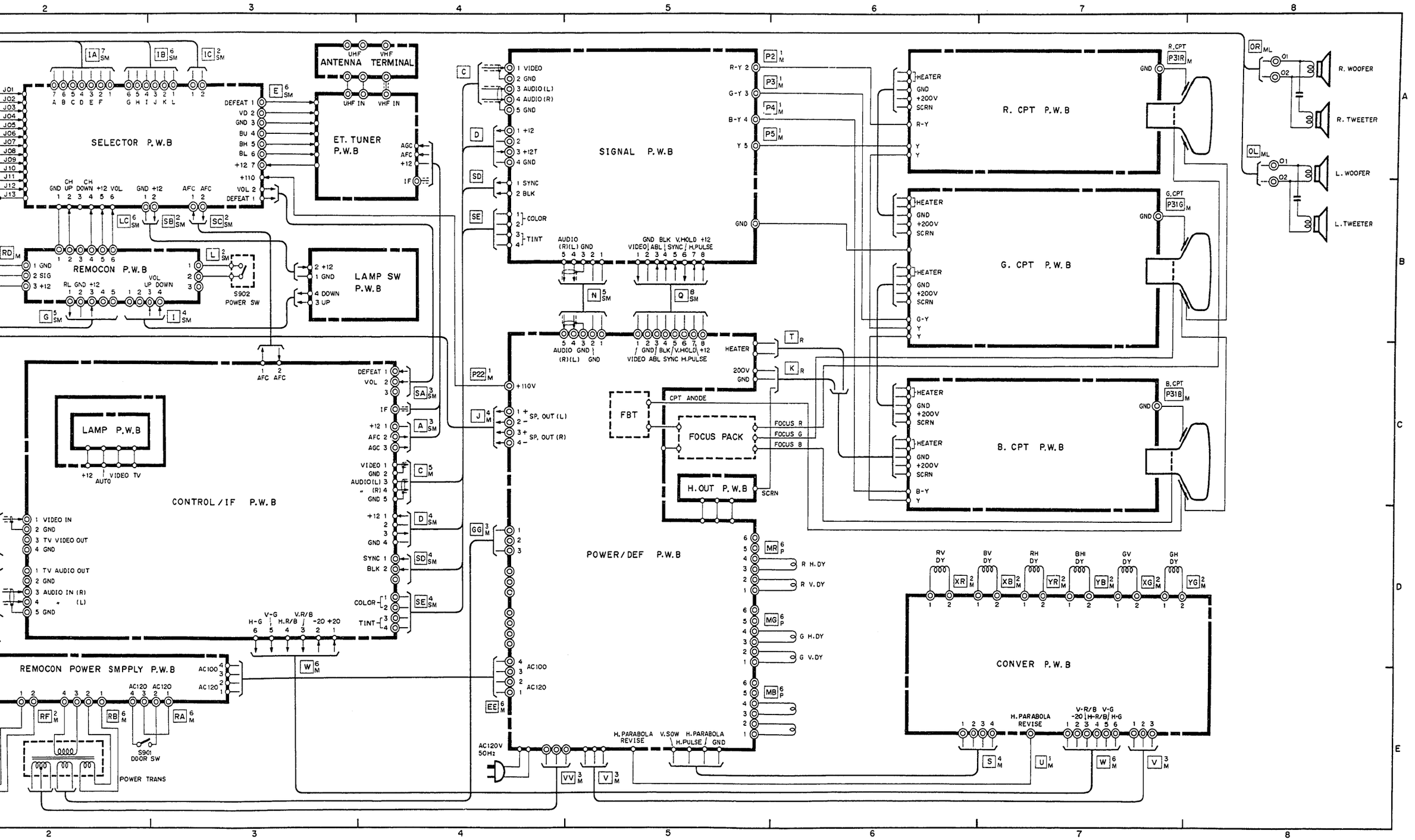
EXPLODED VIEW



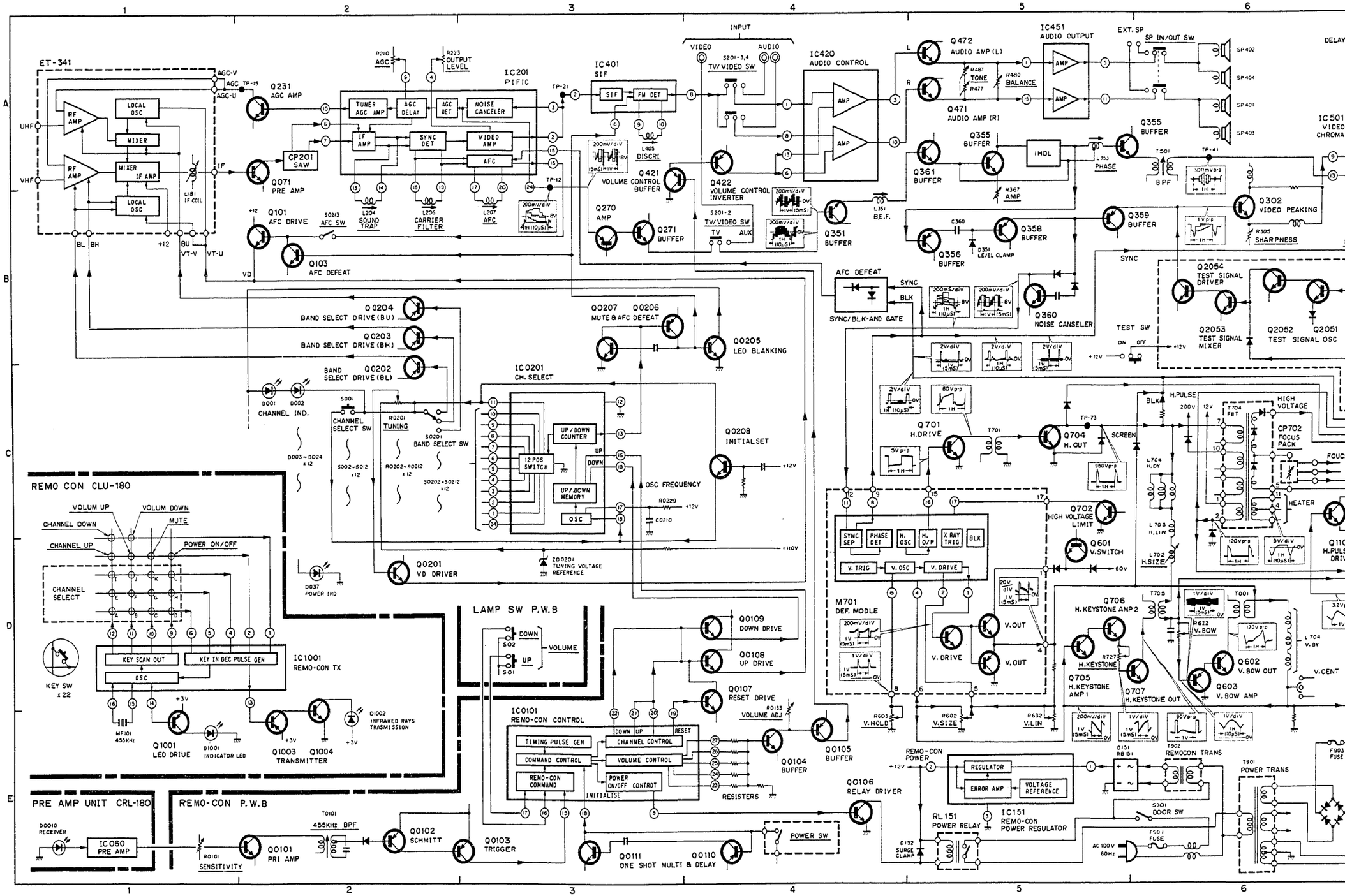
INTERCONNECT WIRING



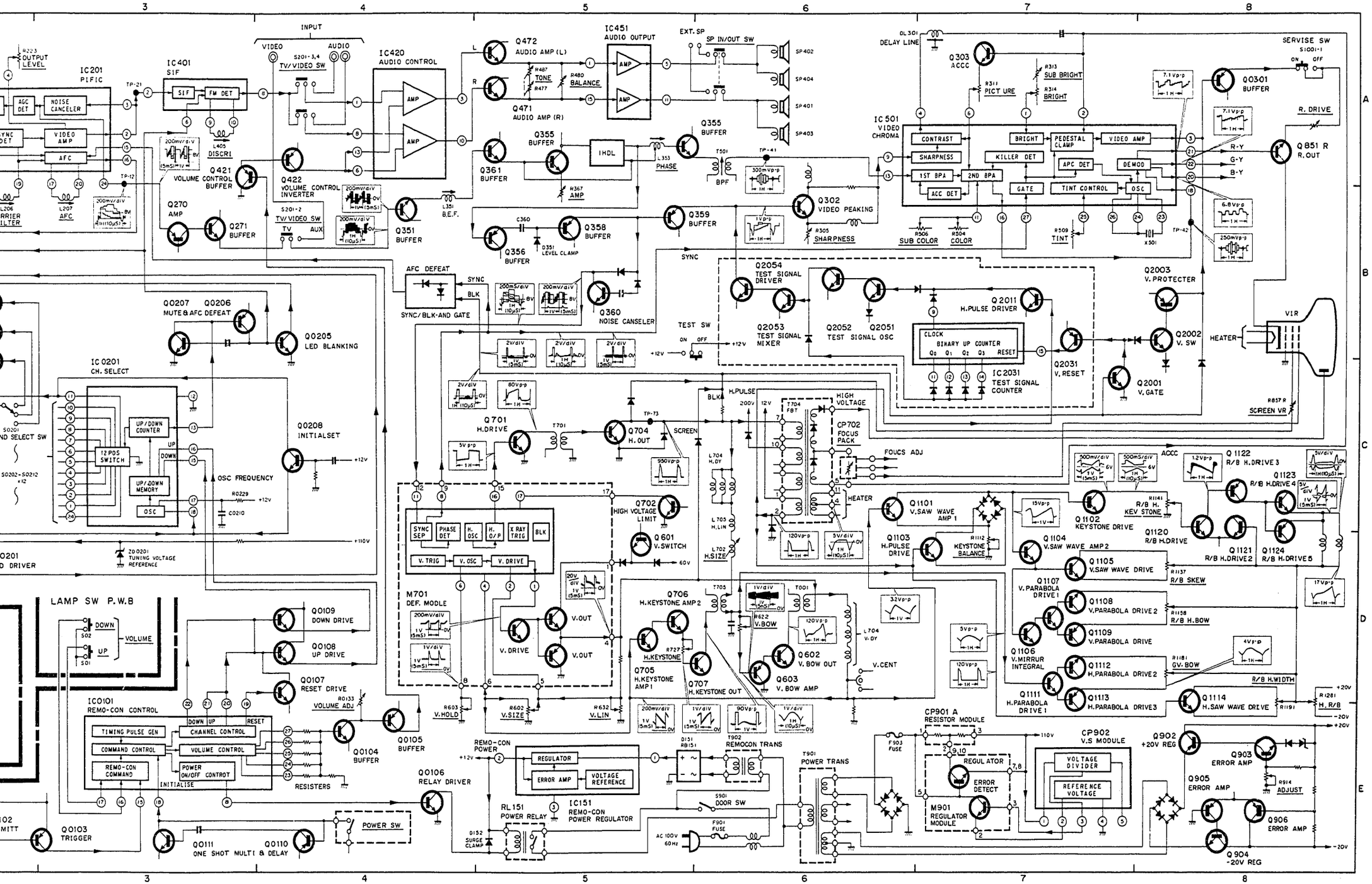
INTERCONNECT WIRING



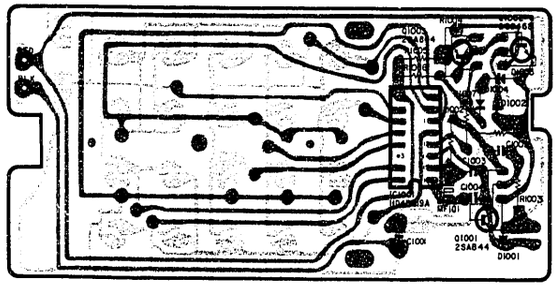
SIMPLIFIED SCHEMATIC DIAGRAM



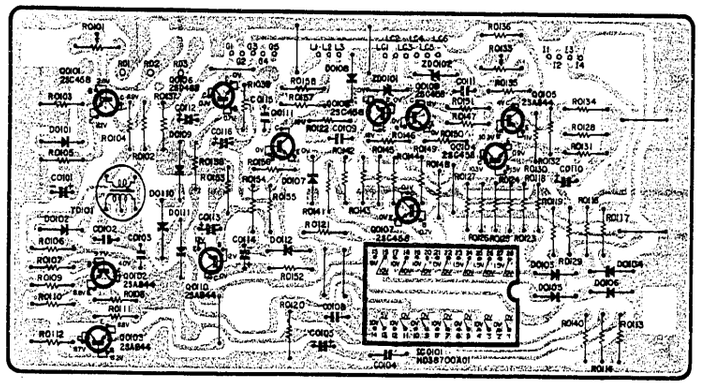
SIMPLIFIED SCHEMATIC DIAGRAM



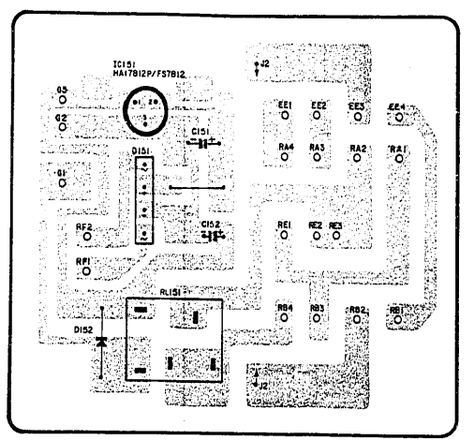
REMOTE TRANSMITTER P.W. BOARD



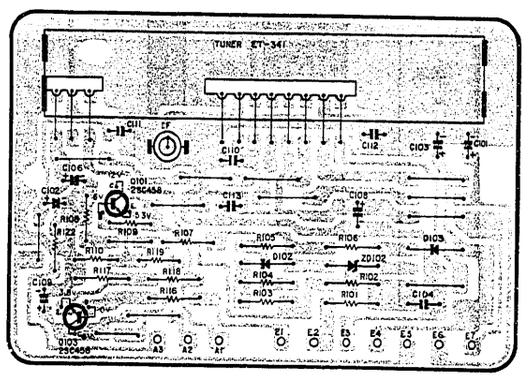
REMOTE AMPLIFIER P.W. BOARD



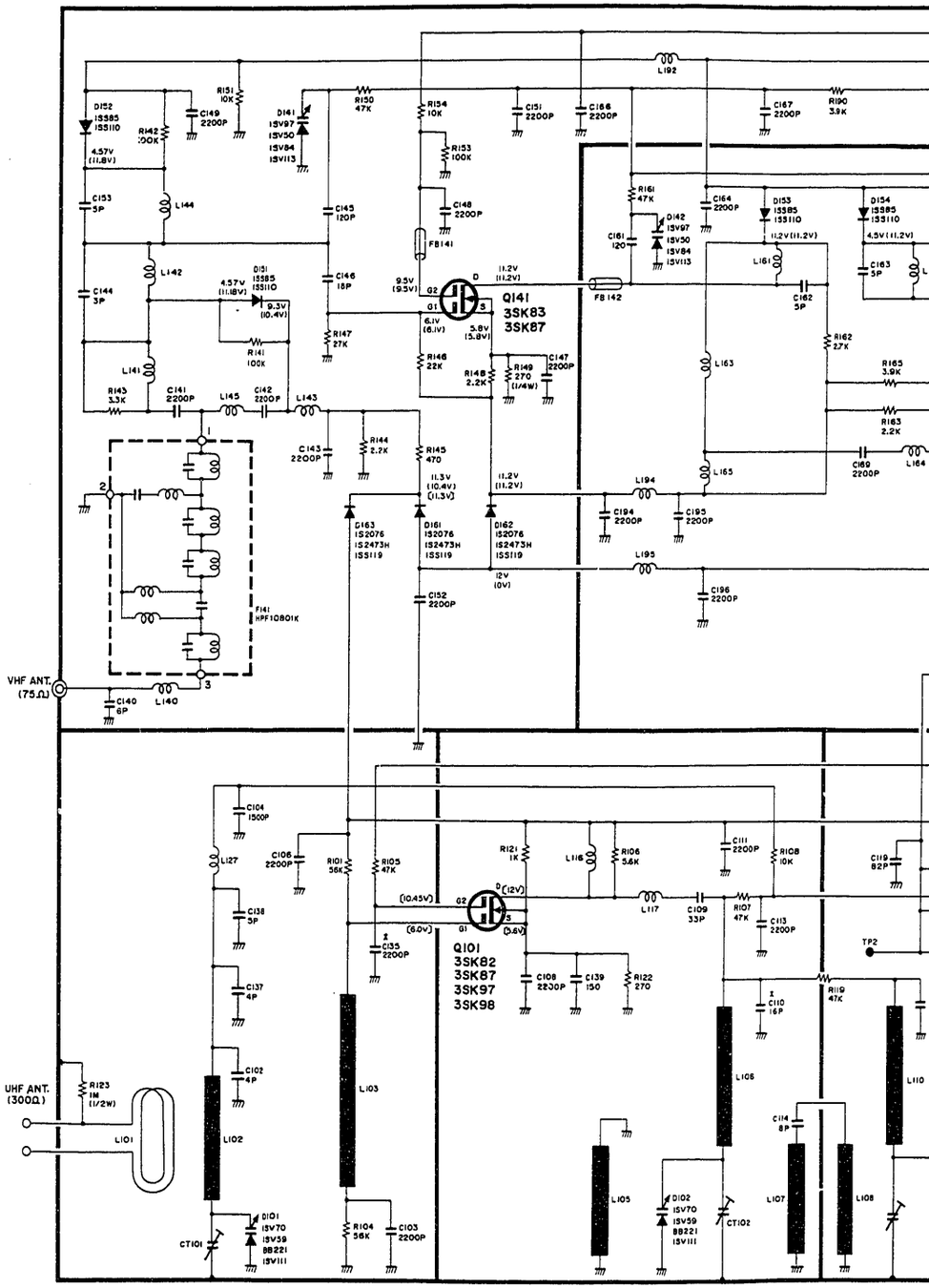
REMOTE POWER P.W. BOARD



ET-TUNER P.W. BOARD



UHF/VHF TUNER CIRCUIT DIAG



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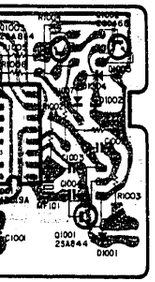

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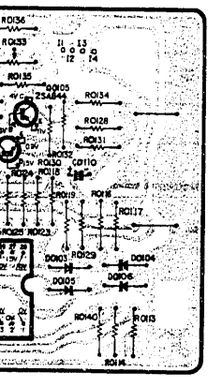
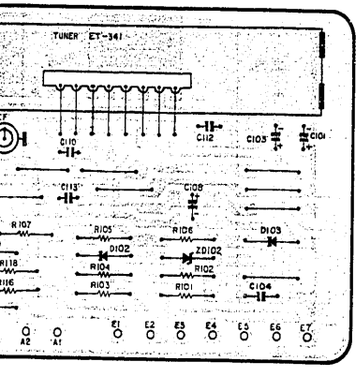
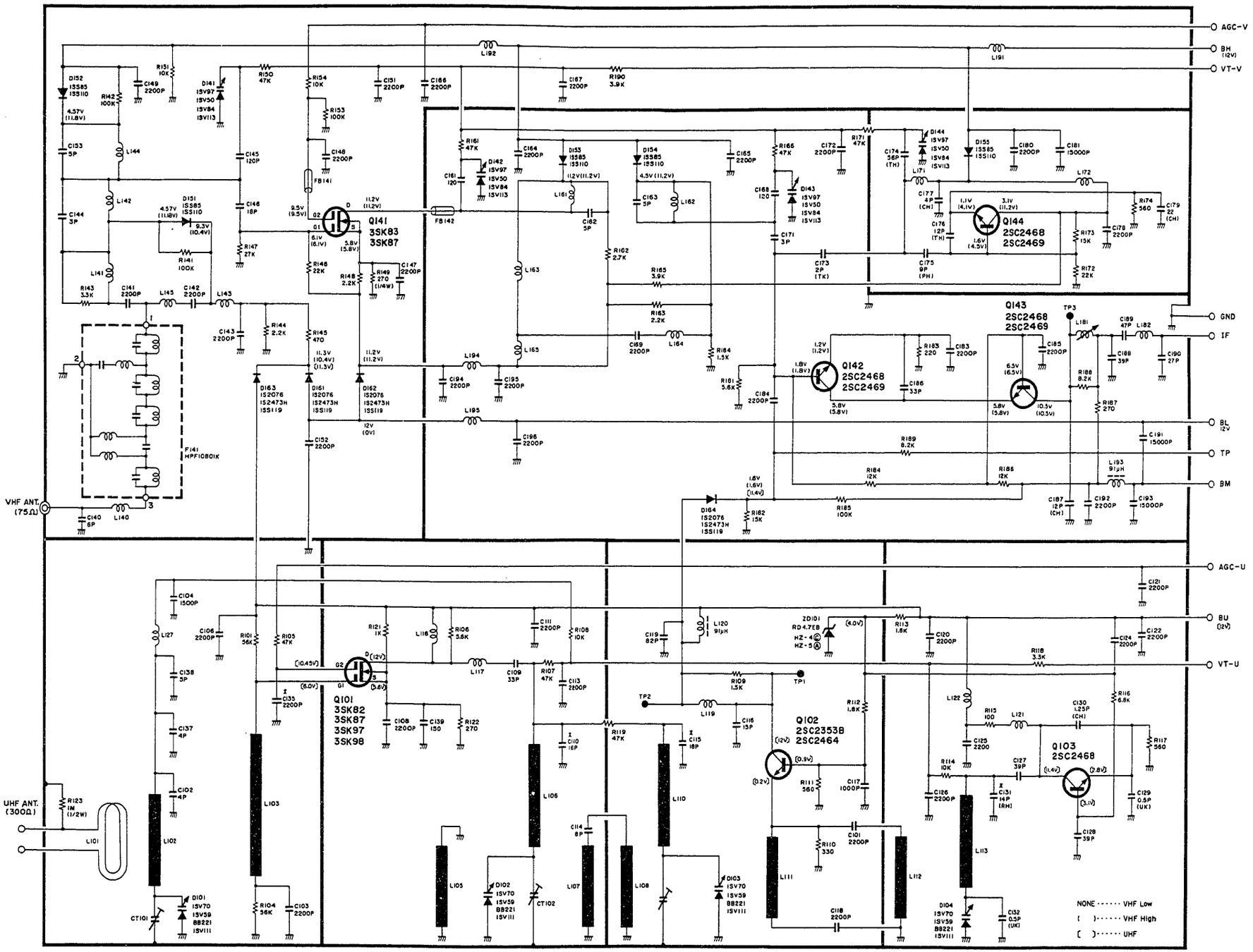


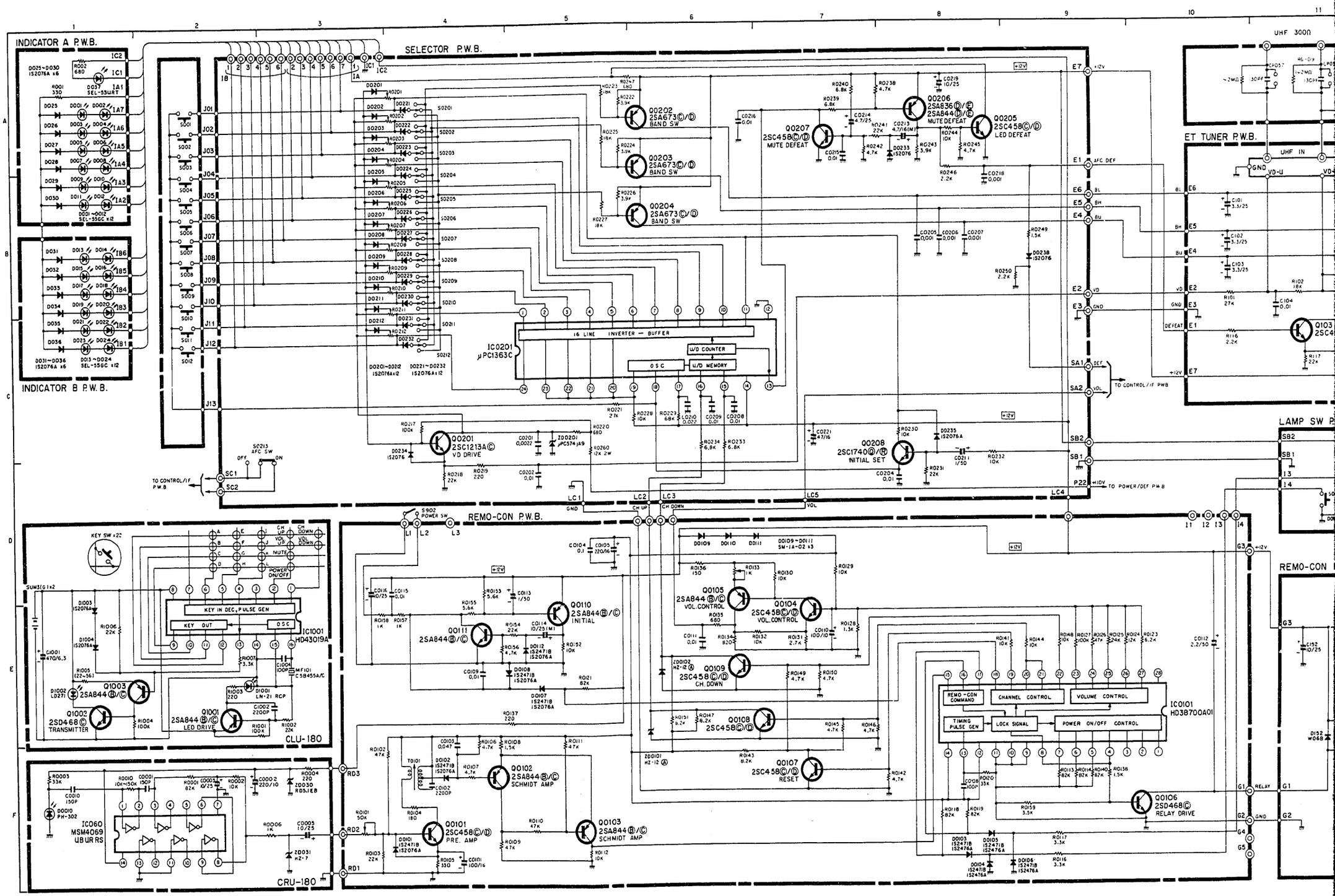
UNER P.W. BOARD



UHF/VHF TUNER CIRCUIT DIAGRAM

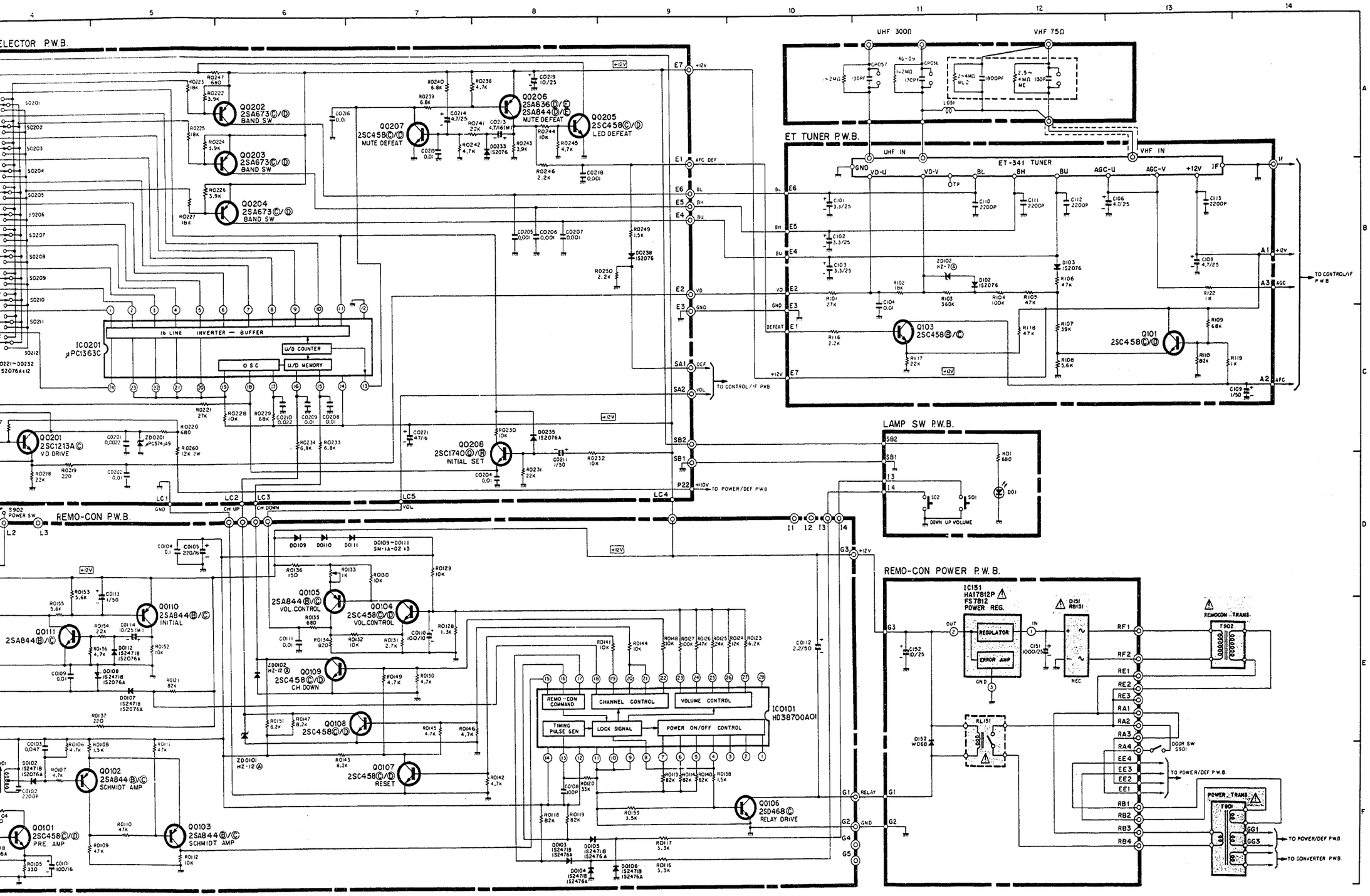


REMOTE CONTROL, SELECTOR CIRCUT DIAGRAM

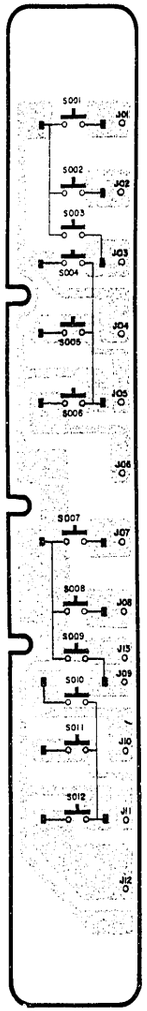


PRODUCT SAFETY NOTE: Components marked with a ⚠ and shaded have special characteristics important to safety. Before replacing any of these components read carefully the product safety notice of this service manual. Don't degrade the safety of the receiver through improper servicing.

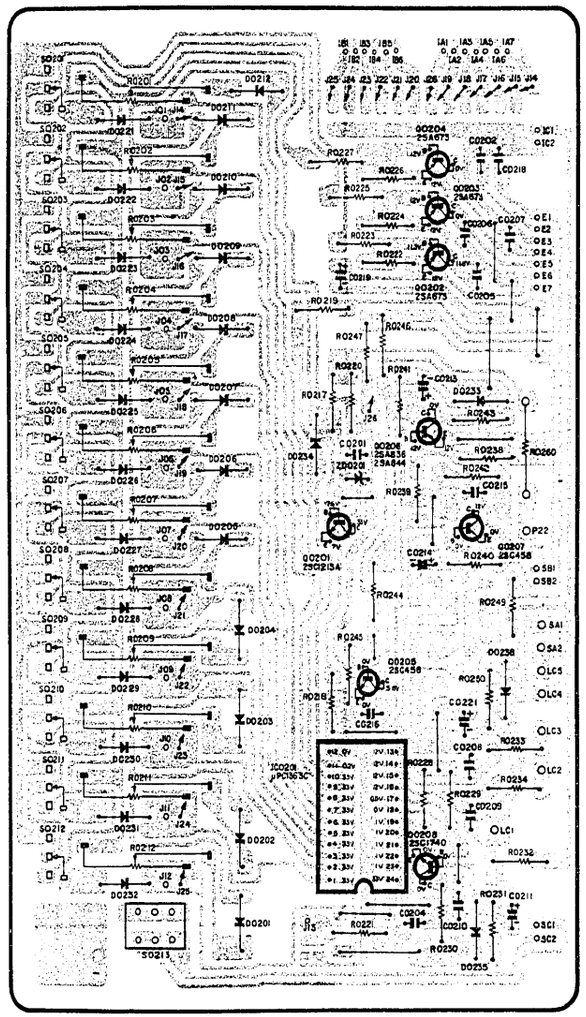
REMOTE CONTROL, SELECTOR CIRCUT DIAGRAM



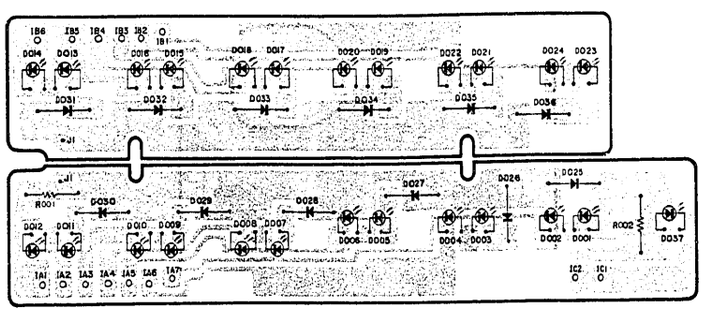
SELECTOR SWITCH P.W. BOARD



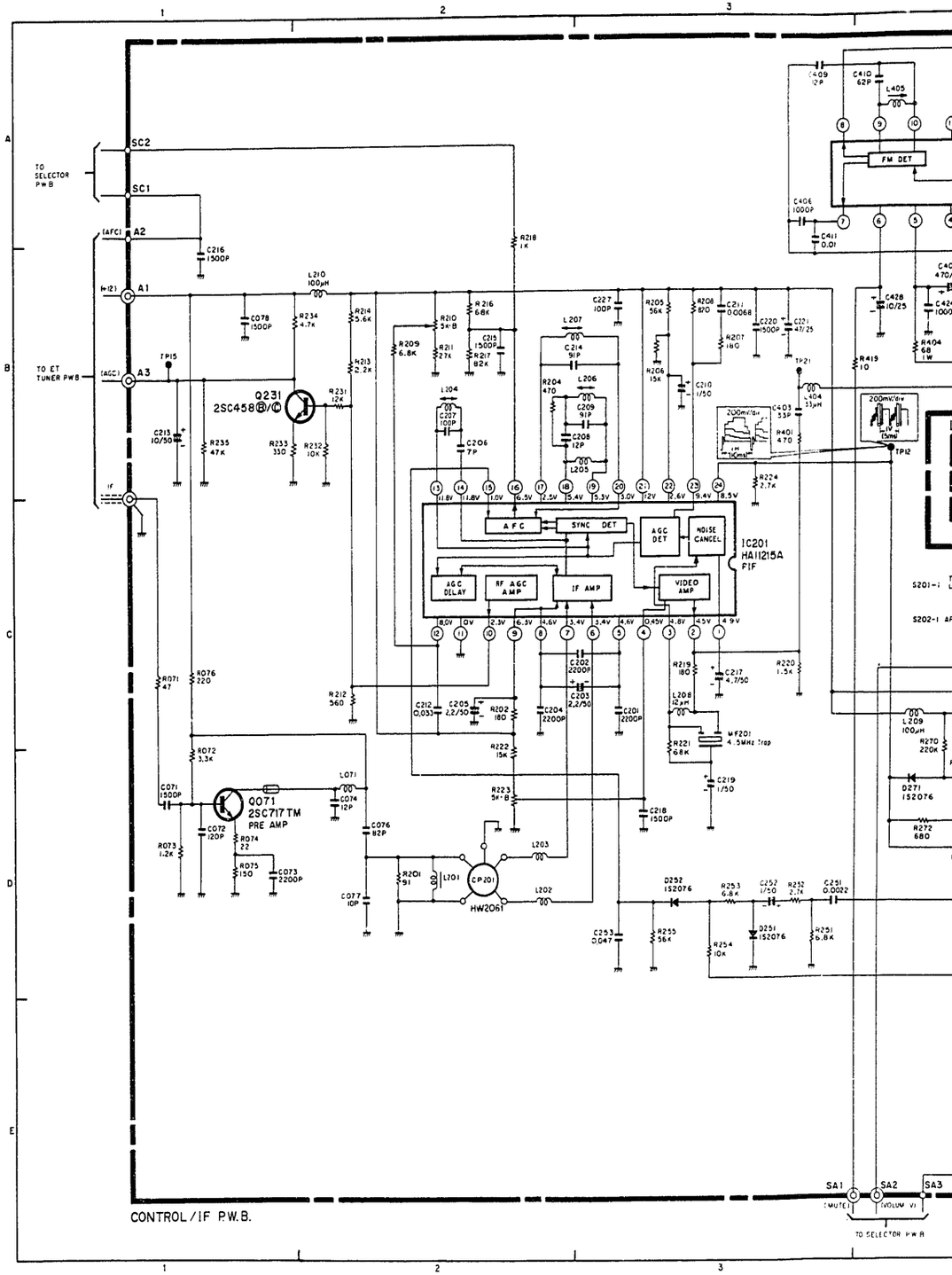
SELECTOR P.W. BOARD



INDICATOR P.W. BOARD



CONTROL IF CIRCUIT DIAGRAM



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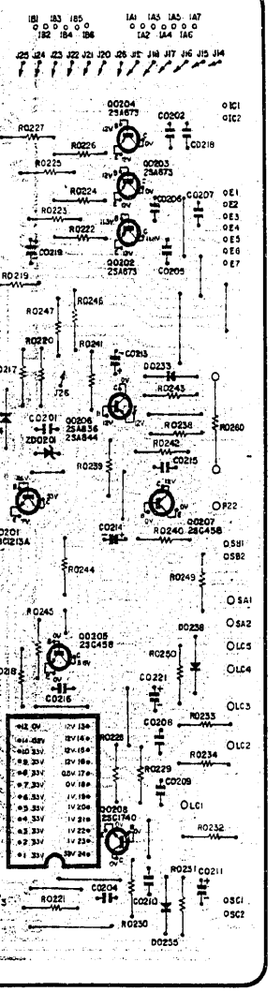
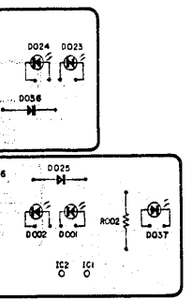
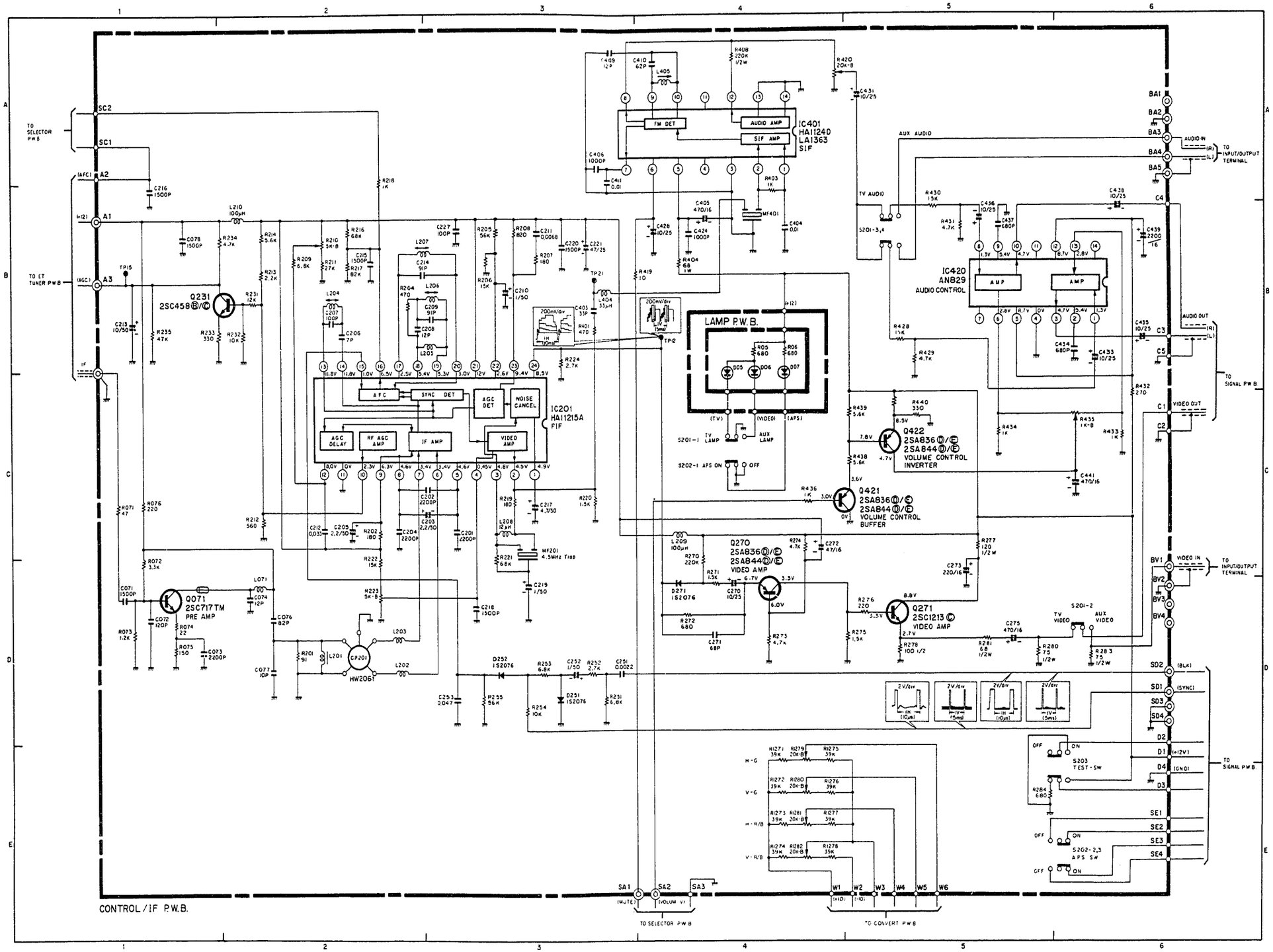
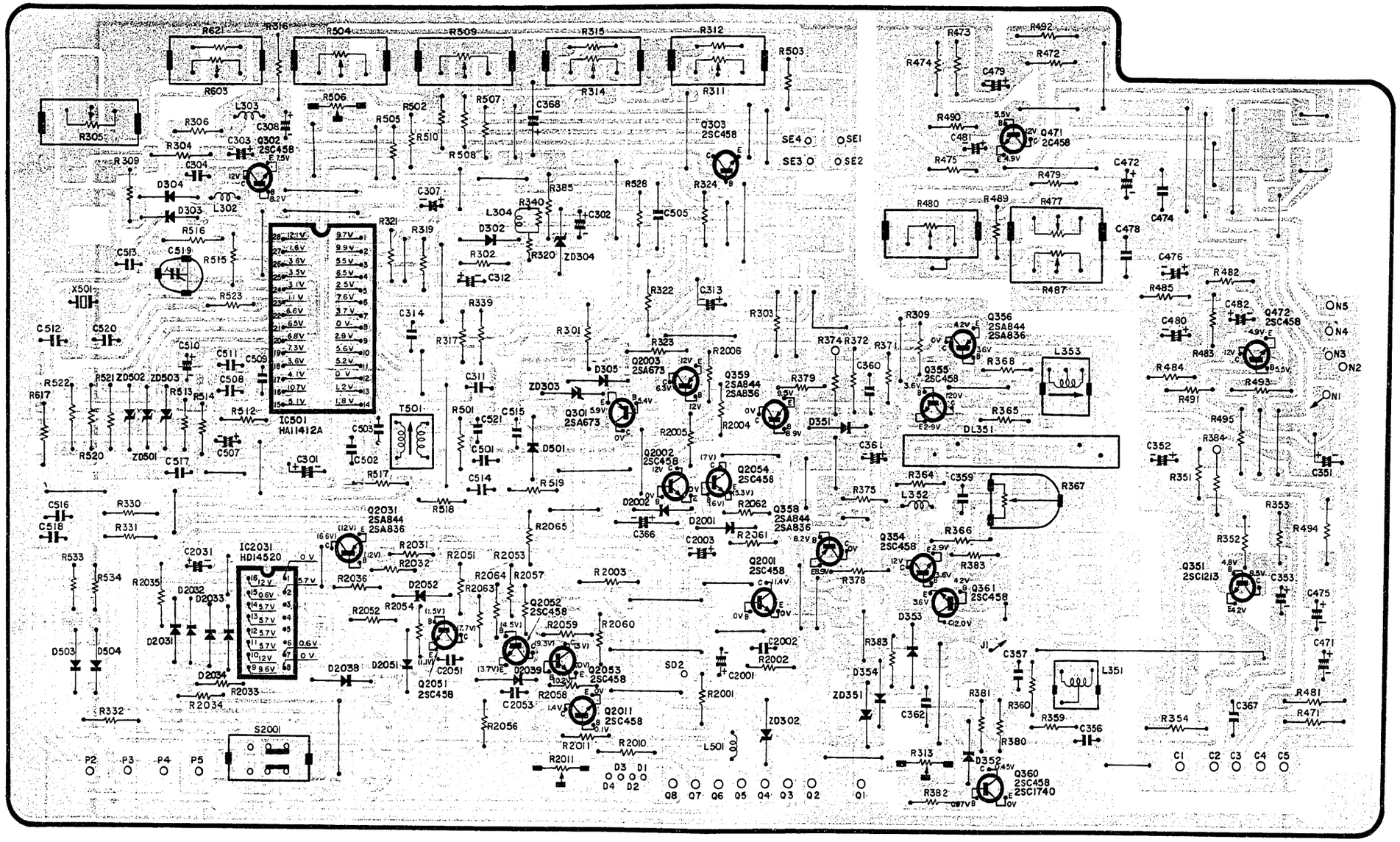




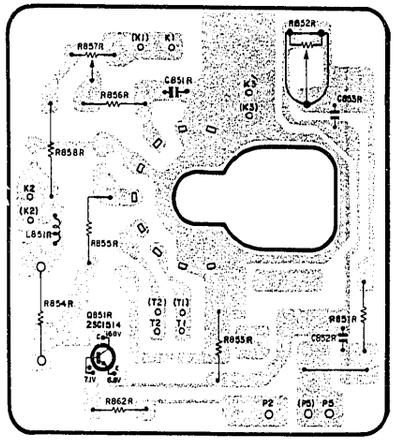
CONTROL IF CIRCUIT DIAGRAM



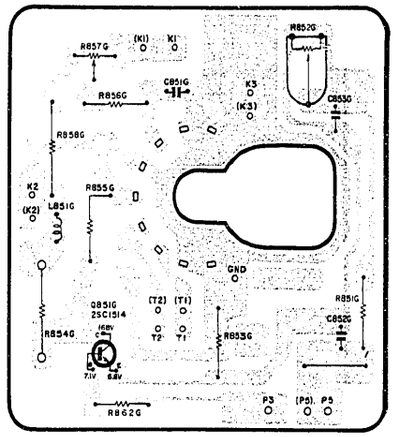
SIGNAL P.W. BOARD



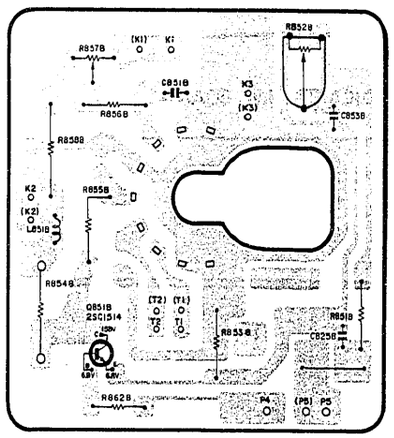
RED DRIVER P.W. BOARD



GREEN DRIVER P.W. BOARD



BLUE DRIVER P.W. BOARD



SIGNAL PROCESSING CIRCUIT DIAGRAM

PRODUCT
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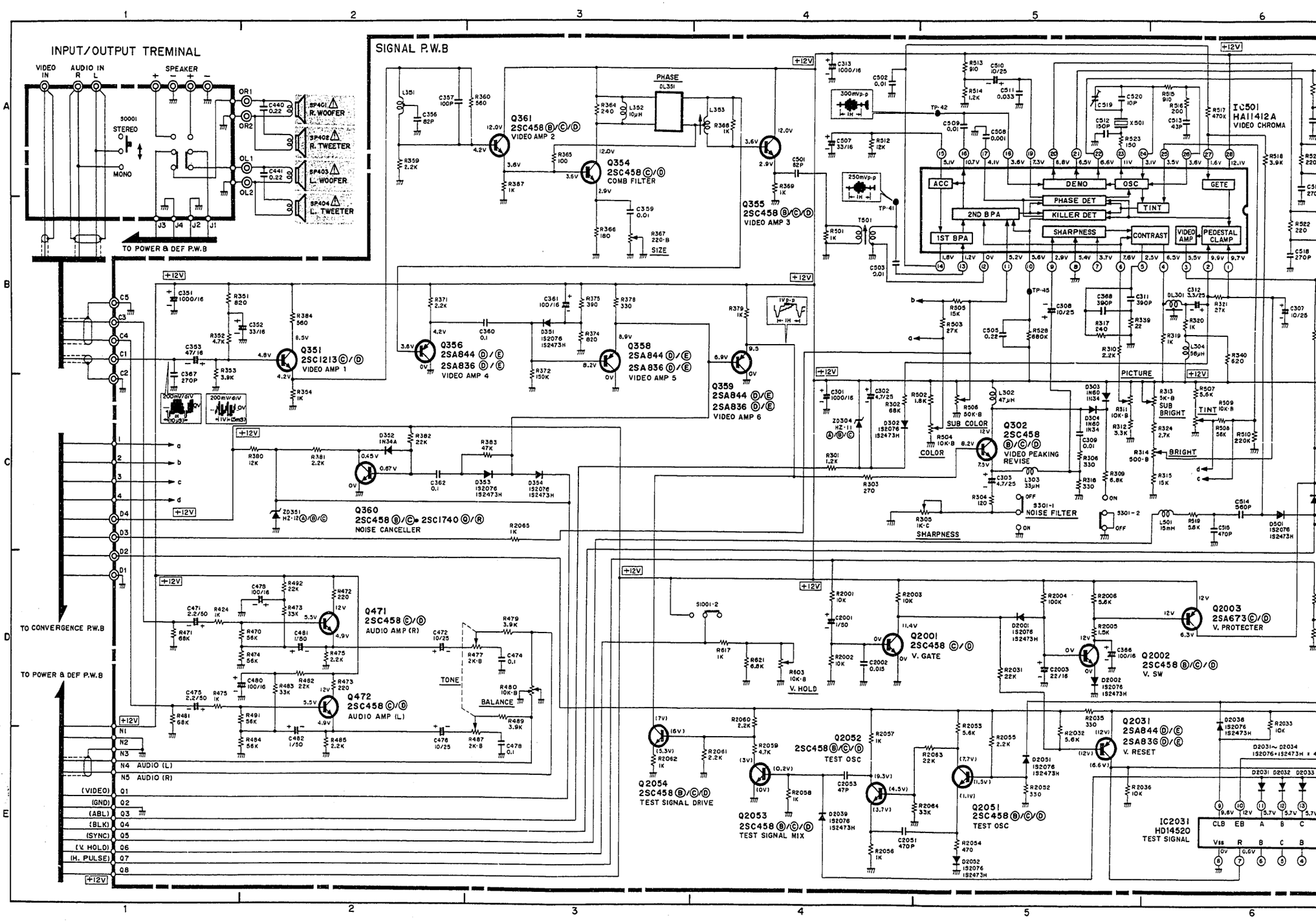
Manual. D



PRODUCT SAFETY NOTE: Components market with a △ and shaded have special characteristics important to safety. Before replacing any of these components, read carefully the PRODUCT SAFETY NOTICE of this Service Manual. Don't degrade the safety of the receiver though improper servicing.

SIGNAL PROCESSING CIRCUIT DIAGRAM

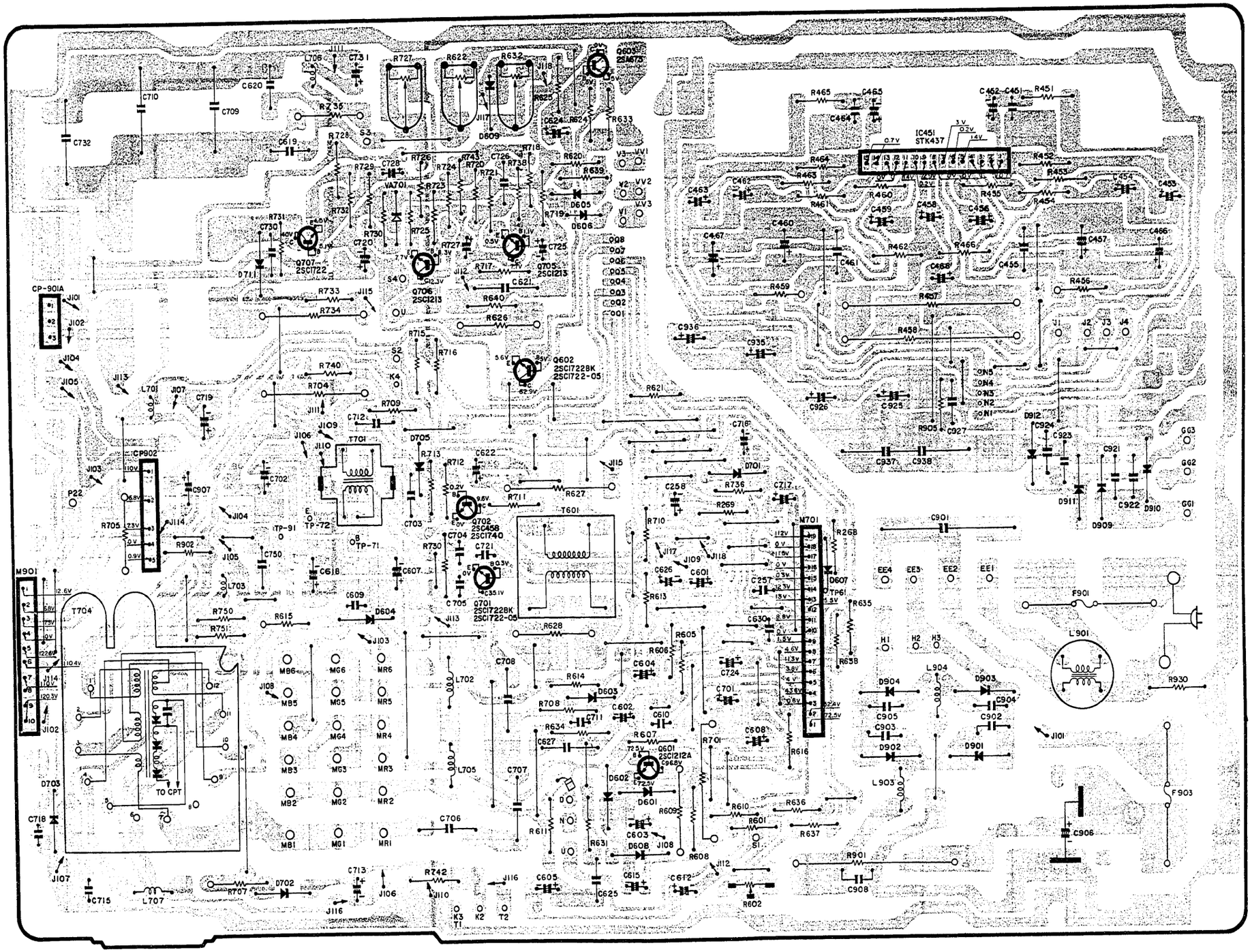
SIGNAL P.W.B

CPT P.W.B x 3

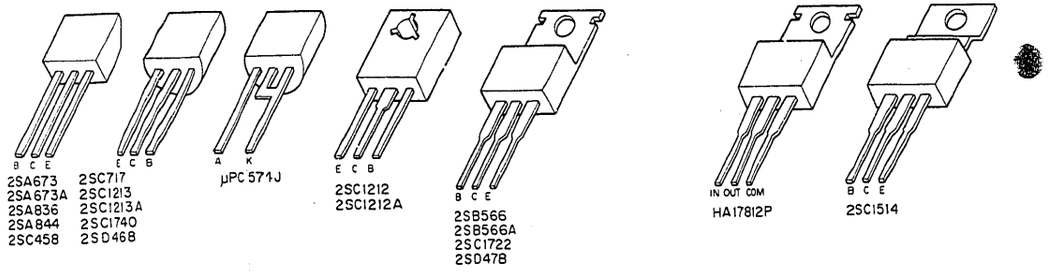
TO POWER & DEF P.W.B

TO POWER & DEF P.W.B

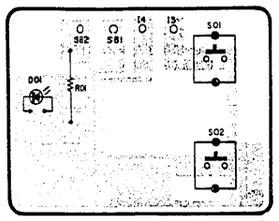
POWER/DEFLECTION P.W. BOARD



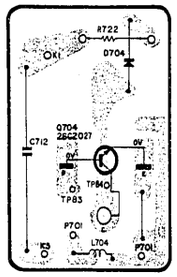
ACTIVE DEVICE BASINGS



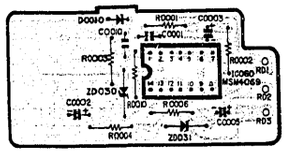
POWER INDICATOR/ VOLUME UP-DOWN P.W. BOARD



HORIZONTAL OUTPUT P.W. BOARD

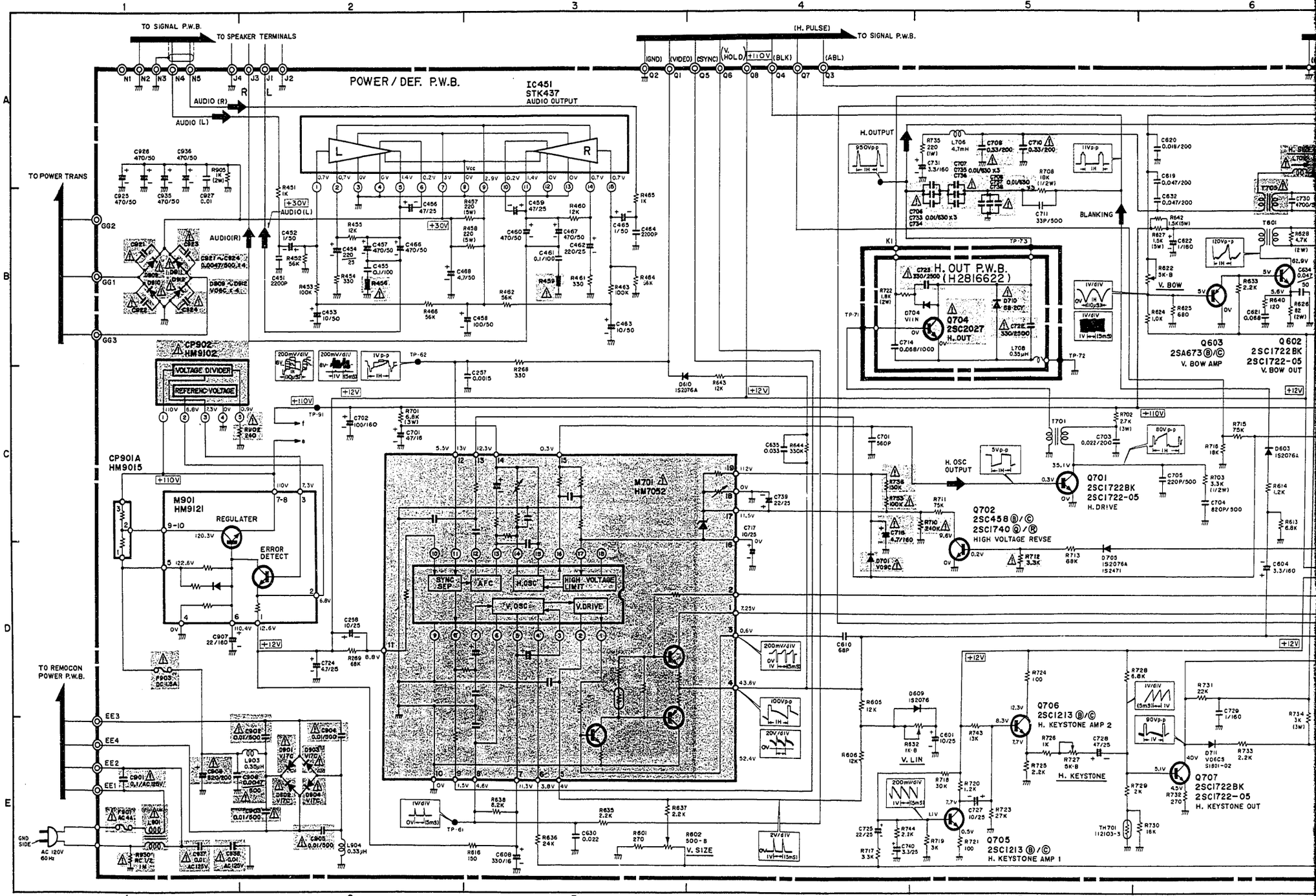


REMOTE PRE AMP P.W. BOARD



POWER-DEFLECTION CIRCUIT DIAGRAM

PRODUCT SAFETY NOT
Before replacing any of th
safety of the receiver throu



POWER-DEFLECTION CIRCUIT DIAGRAM

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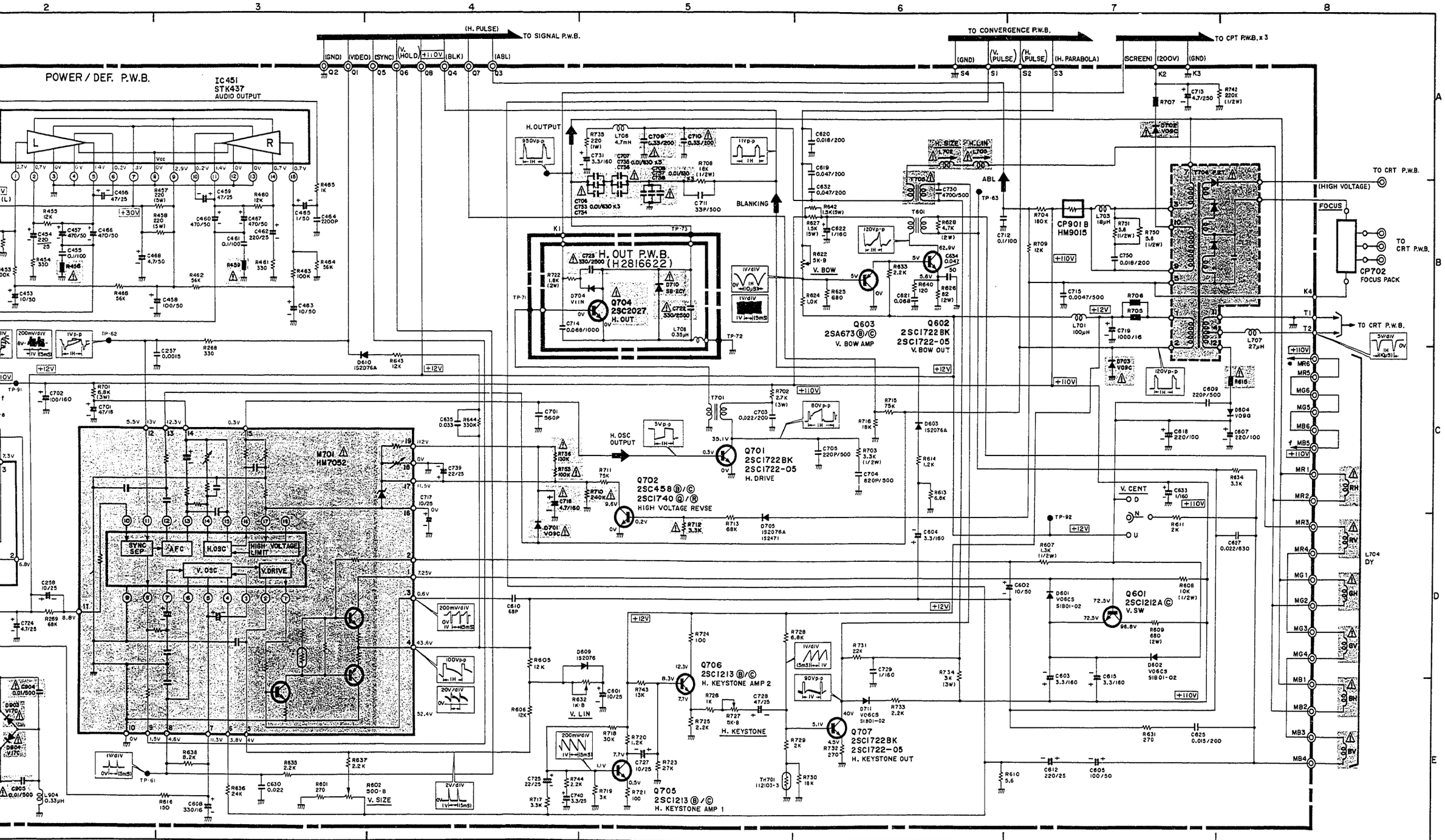
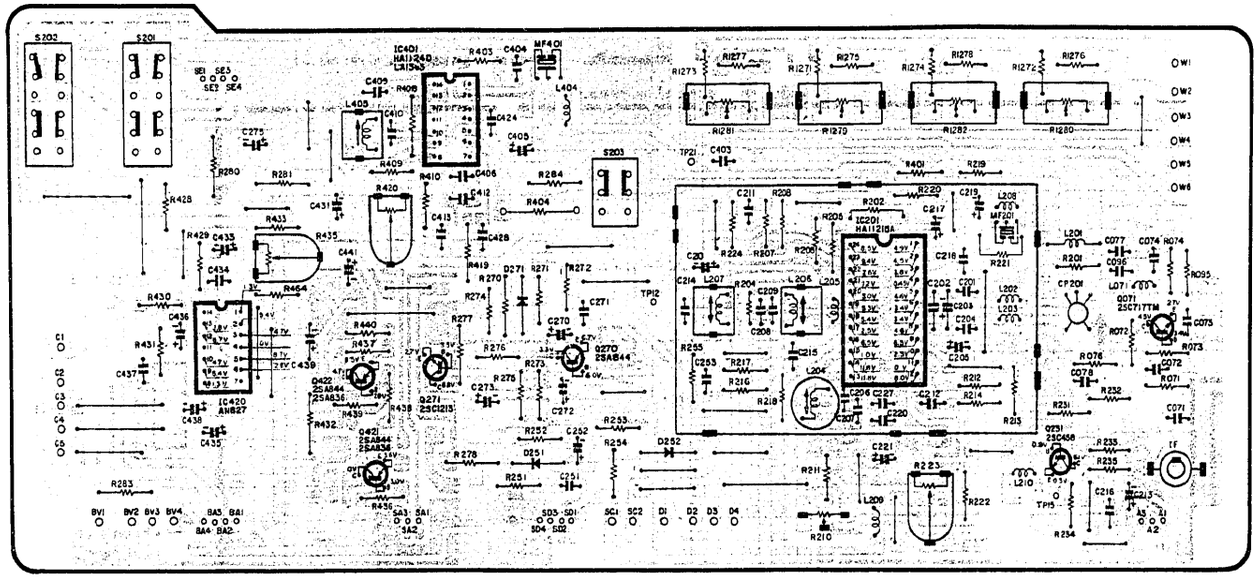
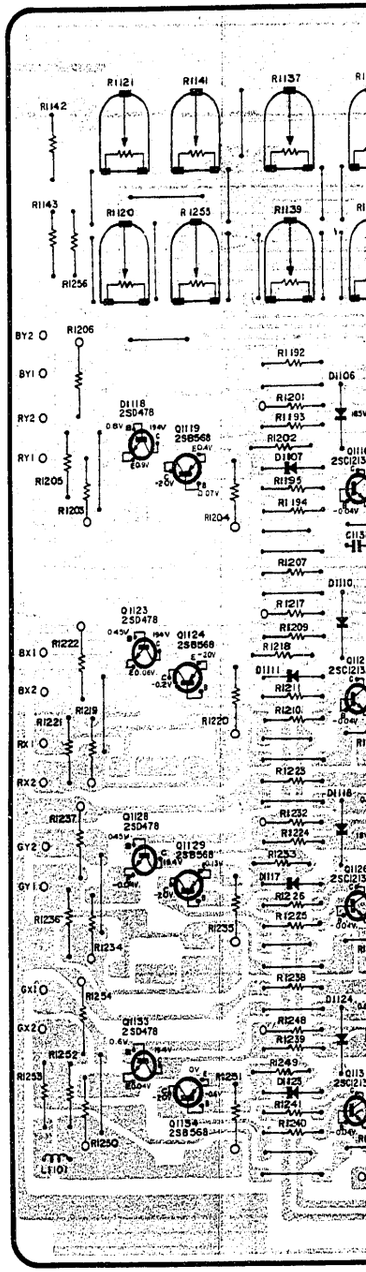
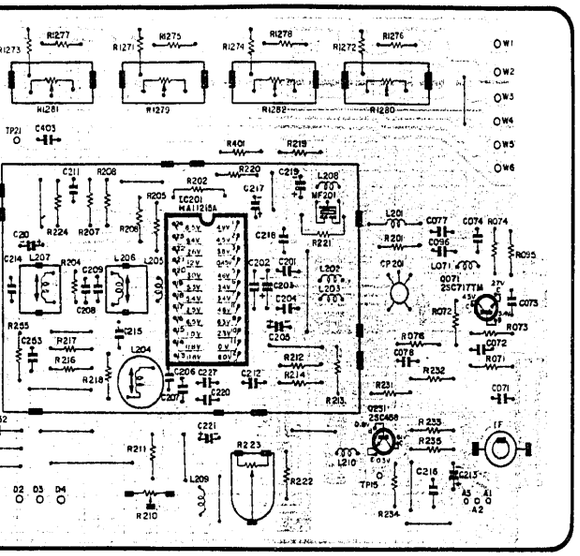


CONTROL/I-F P.W. BOARD

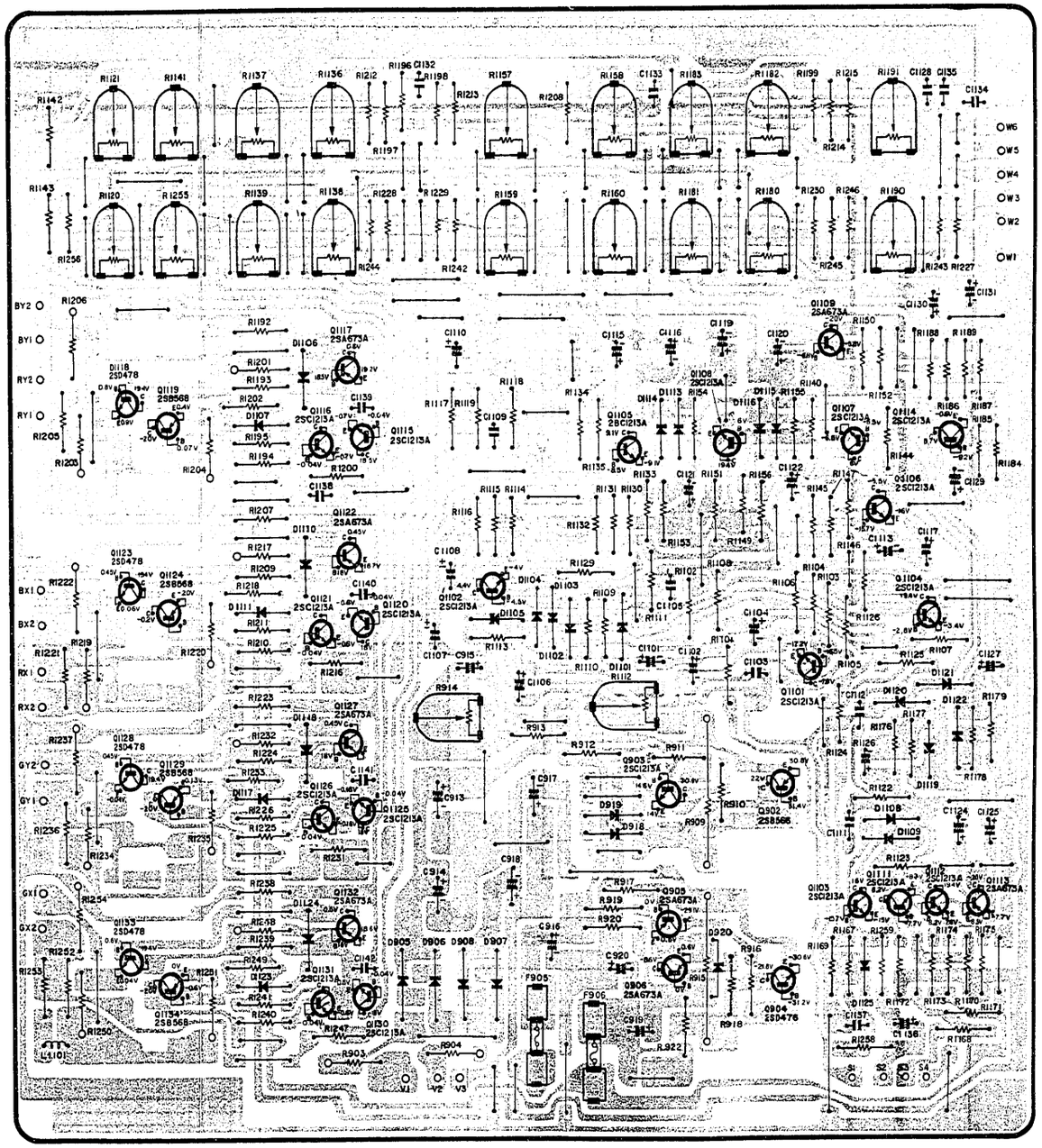




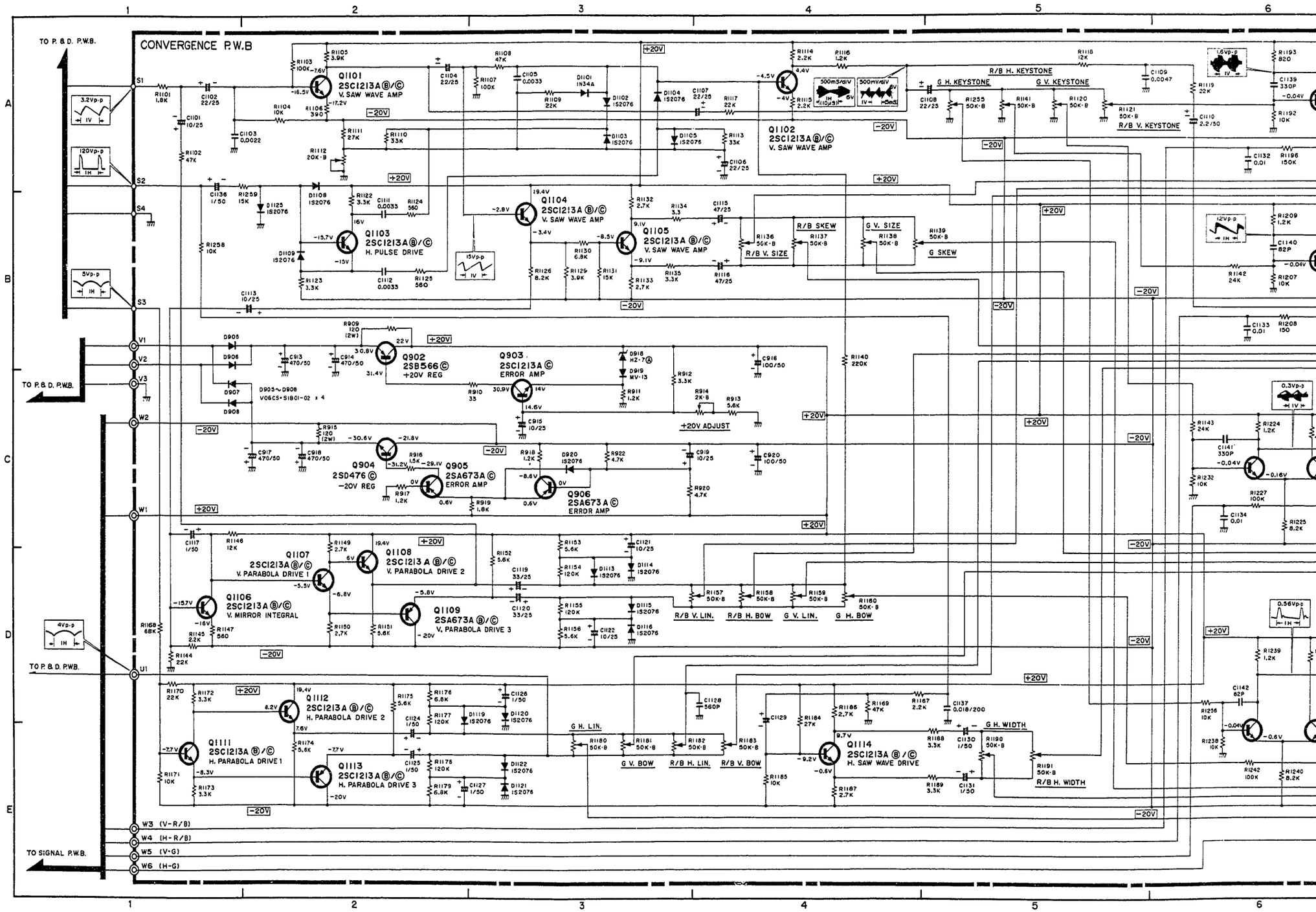
OARD



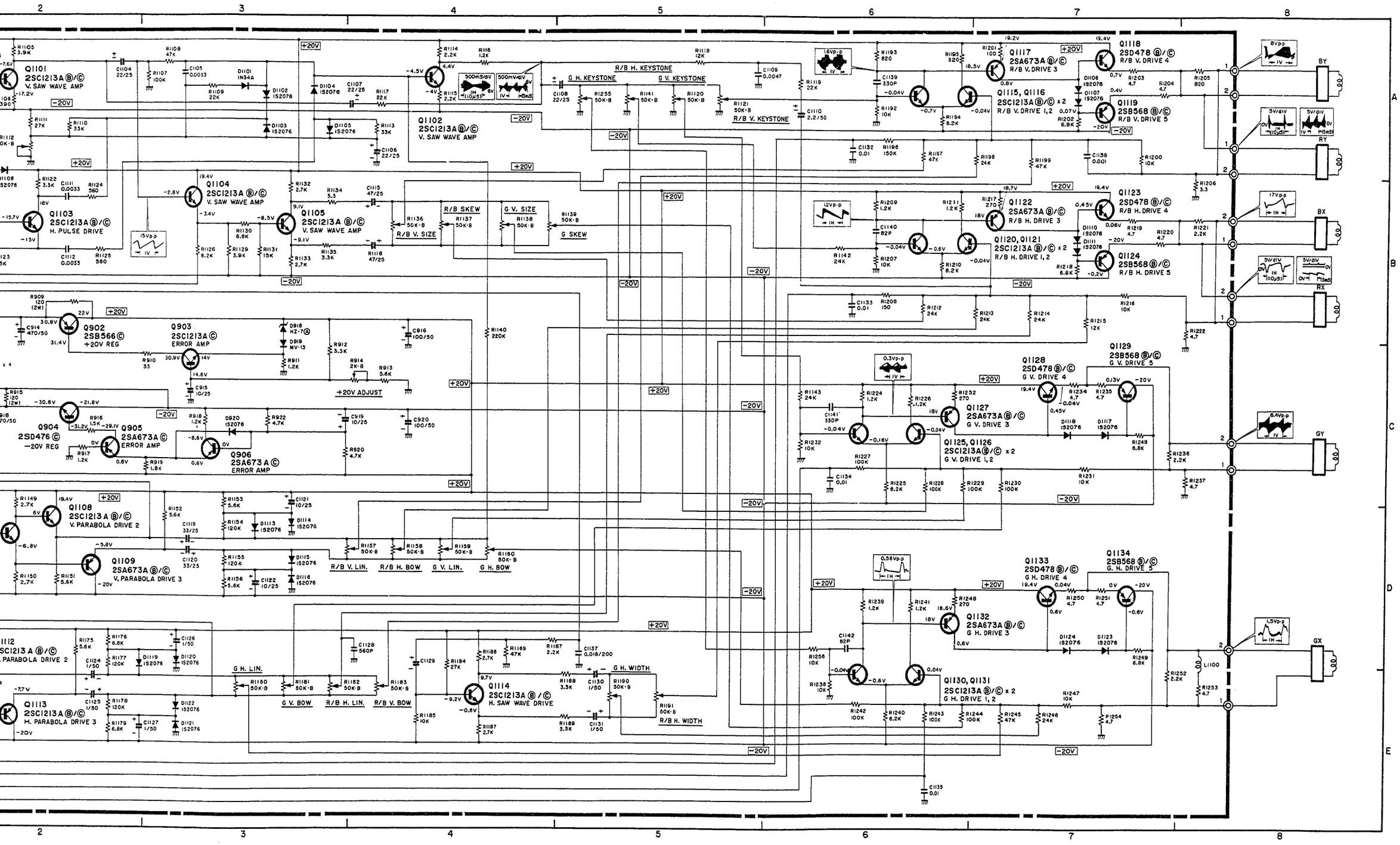
CONVERGENCE P.W. BOARD



CONVERGENCE CIRCUIT DIAGRAM



CONVERGENCE CIRCUIT DIAGRAM


Q1101 2SC1213A Ⓑ/Ⓒ V. SAW WAVE AMP
Q1102 2SC1213A Ⓑ/Ⓒ V. SAW WAVE AMP
Q1103 2SC1213A Ⓑ/Ⓒ H. PULSE DRIVE
Q1104 2SC1213A Ⓑ/Ⓒ V. SAW WAVE AMP
Q1105 2SC1213A Ⓑ/Ⓒ V. SAW WAVE AMP
Q1108 2SC1213A Ⓑ/Ⓒ V. PARABOLA DRIVE 2
Q1109 2SA673A Ⓑ/Ⓒ V. PARABOLA DRIVE 3
Q1113 2SC1213A Ⓑ/Ⓒ H. PARABOLA DRIVE 3
Q1114 2SC1213A Ⓑ/Ⓒ H. SAW WAVE DRIVE
Q902 2SB566Ⓒ +20V REG
Q903 2SC1213AⒸ ERROR AMP
Q904 2SD476Ⓒ −20V REG
Q905 2SA673AⒸ ERROR AMP
Q906 2SA673AⒸ ERROR AMP
Q1115, Q1116 2SC1213A Ⓑ/Ⓒ x2 R/B V. DRIVE 1, 2
Q1117 2SA673A Ⓑ/Ⓒ R/B V. DRIVE 3
Q1118 2SD478 Ⓑ/Ⓒ R/B V. DRIVE 4
Q1119 2SB568 Ⓑ/Ⓒ R/B V. DRIVE 5
Q1120, Q1121 2SC1213A Ⓑ/Ⓒ x2 R/B H. DRIVE 1, 2
Q1122 2SA673A Ⓑ/Ⓒ R/B H. DRIVE 3
Q1123 2SD478 Ⓑ/Ⓒ R/B H. DRIVE 4
Q1124 2SB568 Ⓑ/Ⓒ R/B H. DRIVE 5
Q1125, Q1126 2SC1213A Ⓑ/Ⓒ x2 G V. DRIVE 1, 2
Q1127 2SA673A Ⓑ/Ⓒ G V. DRIVE 3
Q1128 2SD478 Ⓑ/Ⓒ G V. DRIVE 4
Q1129 2SB568 Ⓑ/Ⓒ G V. DRIVE 5
Q1130, Q1131 2SC1213A Ⓑ/Ⓒ x2 G H. DRIVE 1, 2
Q1132 2SA673A Ⓑ/Ⓒ G H. DRIVE 3
Q1133 2SD478 Ⓑ/Ⓒ G H. DRIVE 4
Q1134 2SB568 Ⓑ/Ⓒ G H. DRIVE 5
R/B H. KEYSTONE
G H. KEYSTONE
G V. KEYSTONE
R/B V. KEYSTONE
R/B SKEW
R/B V. SIZE
G V. SIZE
G SKEW
+20V ADJUST
R/B V. LIN.
R/B H. BOW
G V. LIN.
G H. BOW
G H. LIN.
G V. BOW
R/B H. LIN.
R/B V. BOW
G H. WIDTH
R/B H. WIDTH
BY
RY
BX
RX
GY
GX
+20V
−20V

REPLACEMENT PARTS LIST

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ABBREVIATIONS: Capacitors . . . . . CD: Ceramic disk, PF: Polyester film, EL: Electrolytic. PP: Polypropylene, PR: Paper.
Resistors . . . . . CF: Carbon film, CC: Carbon composition, OMF: Metal oxide film. VR: Variable resistor, WW: Wire wound, FR: Fuse resistor.
[All CD, PF and PP capacitors are ±5%, 50V and all resistors, ±5%, ¼W unless otherwise noted.]

SYMBOL NO.	PARTS NO.	DESCRIPTION
CAPACITORS		
C071	0244103	CD, 1500pF, ±10%
C072	0248686	CD, 120pF
C073	0244105	CD, 2200pF, ±10%
C074	0246442	CD, 12pF
C076	0246462	CD, 82pF, ±10%
C077	0246420	CD, 10pF, ±0.5%
C078	0244103	CD, 1500pF, ±10%
C101	0252613	EL, 3.3mfd, 25V
C102	0252613	EL, 3.3mfd, 25V
C103	0252613	EL, 3.3mfd, 25V
C104	0277013	PF, 0.01mfd, ±10%
C106	0252615	EL, 4.7mfd, 25V
C108	0252615	EL, 4.7mfd, 25V
C109	0252811	EL, 1mfd, 50V
C110	0244105	CD, 2200pF, ±10%
C111	0244105	CD, 2200pF, ±10%
C112	0244105	CD, 2200pF, ±10%
C113	0244105	CD, 2200pF, ±10%
C114	0244541	CD, 0.01mfd, ±10%, 500V
C151	0252646	EL, 2200mfd, 25V
C152	0252621	EL, 10mfd, 25V
C201	0244105	CD, 2200pF, ±10%
C202	0244105	CD, 2200pF, ±10%
C203	0252817	EL, 2.2mfd, 50V
C204	0244105	CD, 2200pF, ±10%
C205	0252817	EL, 2.2mfd, 50V
C206	0246417	CD, 7pF, ±0.25pF
C207	0246464	CD, 100pF
C208	0246442	CD, 12pF
C209	0246463	CD, 91pF
C210	0252613	EL, 3.3mfd, 25V
C211	0277011	PF, 0.01mfd, ±10%
C212	0277019	PF, 0.033mfd, ±10%
C213	0252621	EL, 10mfd, 25V
C214	0246463	CD, 91pF
C215	0244103	CD, 1500pF, ±10%
C216	0244103	CD, 1500pF, ±10%
C217	0252815	EL, 5mfd, 50V
C218	0244103	CD, 1500pF, ±10%
C219	0252811	EL, 1mfd, 50V
C220	0277003	PF, 1500pF, ±10%
C221	0252525	EL, 47mfd, 16V
C227	0248684	CD, 100pF
C251	0277005	PF, 2200pF, ±10%
C252	0252811	EL, 1mfd, 50V
C253	0276831	PF, 0.047mfd, ±10%
C257	0244103	CD, 1500pF, ±10%
C258	0252621	EL, 10mfd, 25V
C270	0252621	EL, 10mfd, 25V
C271	0248690	CD, 68pF
C272	0252525	EL, 47mfd, 16V
C273	0252532	EL, 200mfd, 16V
C275	0252565	EL, 470mfd, 16V
C301	0252536	EL, 1000mfd, 16V
C302	0252615	EL, 4.7mfd, 25V
C303	0252615	EL, 4.7mfd, 25V
C307	0252621	EL, 10mfd, 25V
C308	0252621	EL, 10mfd, 25V
C309	0277013	PF, 0.01mfd, ±10%
C312	0252613	EL, 3.3mfd, 25V
C313	0252536	EL, 1000mfd, 16V
C314	0248672	CD, 33pF
C351	0252536	EL, 1000mfd, 16V
C352	0252523	EL, 30mfd, 16V
C353	0252525	EL, 47mfd, 16V
C356	0248682	CD, 82pF
C357	0248684	CD, 100pF
C359	0274763	PF, 1000pF, ±10%
C360	0252522	EL, 20mfd, 15V
C362	0277025	PF, 0.1mfd, ±10%, 200V
C365	0252811	EL, 1mfd, 50V
C366	0252531	EL, 100mfd, 16V
C367	0248694	CD, 270pF
C368	0252621	EL, 10mfd, 25V
C369	0277025	PF, 0.1mfd, ±10%, 200V
C403	0248672	CD, 33pF
C404	0244171	CD, 0.01mfd
C405	0252565	EL, 470mfd, 16V
C406	0244139	CD, 1000pF, ±10%
C409	0246442	CD, 12pF
C410	0246719	CD, 62pF
C413	0276831	PF, 0.047mfd, ±10%
C424	0244139	CD, 1000pF, ±10%
C428	0277025	PF, 0.1mfd, ±10% 200V
C431	0252621	EL, 10mfd, 25V
C433	0252621	EL, 10mfd, 25V
C434	0244117	CD, 680pF, ±10%
C435	0252621	EL, 10mfd, 25V
C436	0252621	EL, 10mfd, 25V
C437	0244117	CD, 680pF, ±10%
C438	0252621	EL, 10mfd, 25V
C439	0252565	EL, 470mfd, 16V
C441	0252525	EL, 47mfd, 16V
C451	0244105	CD, 2200pF, ±10%
C452	0252811	EL, 1mfd, 50V
C453	0252821	EL, 10mfd, 50V
C453	0252821	EL, 10mfd, 50V
C454	0252662	EL, 220mfd, 25V
C455	0279859	PF, 0.1mfd, ±10%
C456	0252625	EL, 50mfd, 25V
C457	0252835	EL, 470mfd, 50V
C458	0252861	EL, 100mfd, 50V
C459	0252625	EL, 50mfd, 25V
C460	0252835	EL, 470mfd, 50V
C461	0279859	PF, 0.1mfd, ±10%
C462	0252662	EL, 220mfd, 25V
C463	0252821	EL, 10mfd, 50V
C464	0244105	CD, 2200pF, ±10%
C465	0252811	EL, 1mfd, 50V
C466	0252835	EL, 470mfd, 50V
C467	0252835	EL, 470mfd, 50V
C468	0252815	EL, 5mfd, 50V
C471	0252817	EL, 2.2mfd, 50V
C472	0252621	EL, 10mfd, 25V
C474	0276835	PF, 0.1mfd
C475	0252817	EL, 2.2mfd, 50V
C476	0252621	EL, 10mfd, 25V
C478	0276835	PF, 0.1mfd
C479	0253050	EL, 100mfd, 16V
C480	0253050	EL, 100mfd, 16V
C481	0252811	EL, 1mfd, 50V
C482	0252811	EL, 1mfd, 50V
C490	0257048	EL, 2.2mfd, 25V
C491	0257048	EL, 2.2mfd, 25V
C492	0257048	EL, 2.2mfd, 25V
C493	0257048	EL, 2.2mfd, 25V
C501	0248682	CD, 82pF
C502	0252811	EL, 1mfd, 50V
C503	0244171	CD, 0.01 mfd
C505	0277029	PF, 0.22mfd, ±10% 50V
C507	0252523	EL, 30mfd, 16V
C508	0244139	CD, 1000pF, ±10%
C509	0244171	CD, 0.01mfd
C510	0252621	EL, 10md,f 25V
C511	0274769	PF, 0.033mfd, ±10%
C512	0246598	CD, 150pF
C513	0246455	CD, 43pF
C514	0244115	CD, 560pF, ±10%
C515	0244118	CD, 470pF, ±10%
C516	0244136	CD, 2700pF, ±10%
C517	0244136	CD, 2700pF, ±10%
C518	0244136	CD, 2700pF, ±10%
C519	2784692	Trimmer capacitor, 20pF

SYMBOL NO.	PARTS NO.	DESCRIPTION
C520	0246430	CD, 10pF, ±0.5%
C601	0251090	EL, 10mfd, ±20%, 25V
C602	0252821	EL, 10mfd, 50V
C603	0257536	EL, 3.3mfd, 160V
C604	0257536	EL, 3.3mfd,
C605	0252861	EL, 100mfd, 50V
C607	0259867	EL, 220mfd, 100V
C608	0252563	EL, 330mfd, 16V
C609	0243505	CD, 220pF, ±10%
C610	0247850	CD, 68pF, 500V
C612	0252662	EL, 220mfd, 25V
C615	0257536	EL, 3.3mfd, 160V
C618	0259867	EL, 220mfd, 100V
C619	0299922	PP, 330pF, ±10%, 2.5KV
C620	0299917	PF, 0.018mfd, 200V
C621	0277023	PF, 0.068mfd, ±10%
C622	0257535	EL, 1mfd, 160V
C625	0299916	PP, 0.015mfd, 200V
C627	0299630	PP, 0.022mfd, ±5%, 630V
C630	0277017	PF, 0.022mfd, ±10%
C632	0299922	PP, 330pF, ±10%, 2.5KV
C633	0257535	EL, 1mfd, 160V
C634	0275015	PF, 0.047mfd, ±10%
C635	0279853	PF, 0.033mfd, ±10% 100V
C701	0252525	EL, 47mfd, 16V
C702	0259857	EL, 100mfd, 160V
C703	0299918	PP, 0.022mfd, ±10% 200V
C704	0243512	CD, 820pF, ±10%, 500V
C705	0243505	CD, 220pF, ±10%, 500V
⚠ C706	0299981	PP, 0.01mfd, ±5%, 630V
⚠ C707	0299981	PP, 0.01mfd, ±5%, 63 630V
⚠ C708	0299981	PP, 0.01mfd, ±5%, 630V
⚠ C709	0299932	PP, 0.33mfd, ±10%, 200V
⚠ C710	0299932	PP, 0.33 mfd, ±10%, 200V
C711	0247842	CD, 33pF, 500V
C712	0279859	PF, 0.1mfd, ±10%
C713	0259842	EL, 4.7mfd, AC250V
C714	0215296	PR, 0.068mfd, ±10%
C715	0244509	CD, 4700pF, ±10%
⚠ C716	0257537	EL, 4.7mfd, 160V
C717	0252621	EL, 10mfd, 25V
C719	0252536	EL, 1000mfd, 16V
C721	0244115	CD, 560pF, ±10%
⚠ C722	0243837	CD, 330pF, ±10%, 2.5KV
⚠ C723	0243837	CD, 330pF, ±10%, 2.5KV
C724	0252615	EL, 4.7mfd, 25V
C725	0252622	EL, 220mfd, 25V
C727	0252621	EL, 10mfd, 25V
C728	0252625	EL, 50mfd, 25V
C729	0257535	EL, 1mfd, 160V
C730	0244509	CD, 4700pF, ±10%
C731	0257536	EL, 3.3mfd, 160V
⚠ C733	0299981	PP, 0.01mfd, ±5%, 630V
⚠ C734	0299981	PP, 0.01mfd, ±5%, 630V
⚠ C735	0299981	PP, 0.01mfd, ±5%, 630V
⚠ C736	0299981	PP, 0.01mfd, ±5%, 630V
⚠ C737	0299981	PP, 0.01mfd, ±5%, 630V
⚠ C738	0299981	PP, 0.01mfd, ±5%, 630V
C739	0252622	EL, 22mfd, 25V
C740	0252536	EL, 1000mfd, 16V
C750	0299917	PP, 0.018mfd, ±10% 200V
C851B	0243425	CD, 100pF
C851G	0243425	CD, 100pF
C851R	0243425	CD, 100pF
C854G	0244505	CD, 2200pF, ±10%
⚠ C901	0279731	PF, 0.1mfd, ±20%, 125V
⚠ C902	0249146	CD, 0.01mfd, ±10%
⚠ C903	0249146	CD, 0.01mfd, ±10%
⚠ C904	0249146	CD, 0.01mfd, ±10%
⚠ C905	0249146	CD, 0.01mfd, ±10%
⚠ C906	0259908	EL, 820mfd, 200V
C907	0258585	EL, 22mfd, 160V
⚠ C908	0244565	CD, 4700pF, +100, -0%, 500V
C913	0252835	EL, 470mfd, 50V
C914	0252835	EL, 470mfd, 50V
C915	0252621	EL, 10mfd, 25V
C916	0252861	EL, 100mfd, 50V
C917	0252835	EL, 470mfd,50V
C918	0252835	EL, 470mfd, 50V
C919	0252621	EL, 10mfd, 25V
C920	0252861	EL, 100mfd, 50V
⚠ C921	0244565	CD, 4700pF, +100, -0%, 500V
⚠ C922	0244565	CD, 4700pF, +100, -0%, 500V
⚠ C923	0244565	CD, 4700pF, +100, -0%, 500V
⚠ C924	0244565	CD, 4700pF, +100, -0%, 500V
C925	0252835	EL, 470mfd, 50V
C926	0252835	EL, 470mfd, 50V
C927	0244541	CD, 0.01mfd, ±10%, 500V
C935	0252835	EL, 470mfd, 50V
C936	0252835	EL, 470mfd, 50V
⚠ C937	0279728	PF, 0.01mfd, ±20%, 125V
⚠ C938	0279728	PF, 0.01mfd, ±20%, 125V
C0001	0277001	PF, 0.001mfd, ±10%, 50V
C0002	0277001	PF, 0.001mfd, ±10%, 50V
C0201	0274755	PF, 2200pF, ±10%
C0202	0277013	PF, 0.01mfd, ±10%
C0204	0277013	PF, 0.01mfd, ±10%
C0205	0274751	PF, 1000pF, ±10%
C0206	0277001	PF, 1000pF, ±10%
C0207	0277001	PF, 1000pF, ±10%
C0208	0274763	PF, 1000pF, ±10%
C0209	0274763	PF, 1000pF, ±10%
C0210	0277017	PF, 0.022mfd, ±10
C0211	0252615	EL, 4.7mfd, 25V
C0213	0251075	EL, 4.7mfd, 16V
C0214	0252615	EL, 4.7mfd, 25V
C0215	0274763	PF, 1000pF, ±10%
C0216	0274763	PF, 1000pF, ±10%
C0217	0252811	EL, 1mfd, 50V
C0218	0277001	PF, 1000pF, ±10%
C0219	0252621	EL, 10mfd, 25V
C0221	0252525	EL, 47mfd, 16V
C0222	0252531	EL, 100mfd, 16V
C0223	0252615	EL, 4.7mfd, 25V
C0224	0244139	CD, 1000pF, ±10%
C0225	0244139	CD, 1000pF, ±10%
C0226	0244139	CD, 1000pF, ±10%
C0227	0244139	CD, 1000pF, ±10%
C0228	0244139	CD, 1000pF, ±10%
C0229	0244139	CD, 1000pF, ±10%
C0230	0244139	CD, 1000pF, ±10%
C0231	0244139	CD, 1000pF, ±10%
C0232	0244139	CD, 1000pF, ±10%
C0233	0244139	CD, 1000pF, ±10%
C0234	0244139	CD, 1000pF, ±10%
C0235	0244139	CD, 1000pF, ±10%
C0236	0244139	CD, 1000pF, ±10%
C0237	0244139	CD, 1000pF, ±10%
C1101	0252621	EL, 10mfd, 25V
C1102	0252622	EL, 220mfd, 25V
C1103	0244105	CD, 2200pF, ±10%
C1104	0259936	EL, 22mfd, 50V
C1105	0244107	CD, 3300pF, ±10%
C1106	0252622	EL, 220mfd, 25V
C1107	0259936	EL, 22mfd, 50V
C1109	0244109	CD, 4700pF, ±10%
C1111	0244107	CD, 0.0033mfd, ±10%
C1112	0244107	CD, 3300pF, ±10%
C1113	0252621	EL, 10mfd, 25V
C1115	0252625	EL, 50mfd, 25V
C1116	0252625	EL, 50mfd, 25V
C1117	0252811	EL, 1mfd, 50V
C1119	0252623	EL, 330mfd, 25V
C1120	0252623	EL, 330mfd, 25V
C1121	0252621	EL, 10mfd, 25V
C1122	0252621	EL, 10mfd, 25V
C1124	0252811	EL, 1mfd, 50V
C1125	0252811	EL, 1mfd, 50V
C1126	0252811	EL, 1mfd, 50V

PRODUCT SAFETY NOTE: Components marked with a ⚠ have special characteristics important to safety. Before replacing any of these components, read carefully, the PRODUCT SAFETY NOTICE of this Service Manual. Don't degrade the safety of the receiver through improper servicing.

SYMBOL NO.	PARTS NO.	DESCRIPTION
C1127	0252811	EL, 1mfd, 50V
C1128	0244115	CD, 560pF, ±10%
C1129	0252811	EL, 1mfd, 50V
C1130	0252811	EL, 1mfd, 50V
C1131	0252811	EL, 1mfd, 50V
C1132	0244141	CD, 0.01mfd, ±10%
C1133	0244141	CD, 0.01mfd, ±10%
C1134	0244141	CD, 0.01mfd, ±10%
C1135	0244141	CD, 0.01mfd, ±10%
C1136	0252811	EL, 1mfd, 50V
C1137	0299917	PP, 0.018mfd, ±10%, 200V
C1143	0246411	CD, 1pfd, ±0.25%, 50V
C1144	0246411	CD, 1pfd, ±0.25%, 50V
C1145	0259936	EL, 220mfd, 25V
C1146	0259936	EL, 220mfd, ±20%, 25V
C2001	0252811	EL, 1mfd, 50V
C2002	0277015	PF, 0.015mfd, ±10%
C2003	0252522	EL, 20mfd, 15V
C2031	0252522	EL, 20mfd, 15V
C2051	0244118	CD, 470pF, ±10%
C2053	0248672	CD, 33pF

RESISTORS

R01	0114151	CF, 680ohm
R05	0114151	CF, 680ohm
R06	0114151	CF, 680ohm
R001	0114137	CF, 180ohm
R002	0114151	CF, 680ohm
R071	0100033	CF, 47ohm, 1/8W
R072	0100077	CF, 3.3kohm, 1/8W
R073	0100067	CF, 1.2kohm, 1/8W
R074	0100025	CF, 22ohm, 1/8W
R075	0100045	CF, 150ohm, 1/8W
R076	0100049	CF, 220ohm, 1/8W
R101	0114211	CF, 27kohm
R102	0114207	CF, 18kohm
R103	0179539	CC, 360kohm
R104	0114281	CF, 100kohm
R105	0114217	CF, 47kohm
R106	0114217	CF, 47kohm
R107	0114215	CF, 39kohm
R108	0100083	CF, 5.6kohm, 1/8W
R109	0100109	CF, 68kohm, 1/8W
R110	0100111	CF, 82kohm, 1/8W
R116	0114169	CF, 2.2kohm
R117	0114209	CF, 22kohm
R118	0114217	CF, 47kohm
R119	0100065	CF, 1kohm, 1/8W
R112	0100065	CF, 1kohm
R201	0100040	CF, 91ohm, 1/8W
R202	0114137	CF, 180ohm
R204	0100057	CF, 470ohm
R205	0100107	CF, 56kohm, 1/8W
R206	0100093	CF, 15kohm, 1/8W
R207	0100047	CF, 180ohm, 1/8W
R208	0100063	CF, 820ohm, 1/8W
R209	0100085	CF, 6.8kohm, 1/8W
R210	0151254	VR, 5kohm-B
R211	0100099	CF, 27kohm, 1/8W
R212	0100059	CF, 560ohm, 1/8W
R213	0100073	CF, 2.2kohm, 1/8W
R214	0100083	CF, 5.6kohm, 1/8W
R216	0100109	CF, 68kohm, 1/8W
R217	0100111	CF, 82kohm, 1/8W
R218	0100065	CF, 1kohm, 1/8W
R219	0100047	CF, 180ohm, 1/8W
R220	0100069	CF, 1.5kohm, 1/8W
R221	0100109	CF, 68kohm, 1/8W
R222	0100093	CF, 15kohm, 1/8W
R223	0151187	VR, 5kohm-B
R224	0100075	CF, 2.7kohm, 1/8W
R231	0100091	CF, 12kohm, 1/8W
R232	0100089	CF, 10kohm, 1/8W
R233	0100053	CF, 330ohm, 1/8W
R234	0100081	CF, 4.7kohm, 1/8W
R235	0100105	CF, 47kohm, 1/8W
R251	0100085	CF, 6.8kohm, 1/8W
R252	0100075	CF, 2.7kohm, 1/8W
R253	0100085	CF, 6.8kohm, 1/8W
R254	0100089	CF, 10kohm, 1/8W
R255	0100107	CF, 56kohm, 1/8W
R268	0114143	CF, 330ohm
R269	0114221	CF, 68kohm
R270	0114289	CF, 220kohm
R271	0100069	CF, 1.5kohm, 1/8W
R272	0100061	CF, 680ohm, 1/8W
R273	0100081	CF, 4.7kohm, 1/8W
R274	0100081	CF, 4.7kohm, 1/8W
R275	0100069	CF, 1.5kohm, 1/8W
R276	0100049	CF, 220ohm, 1/8W
R277	0113727	CF, 120ohm, 1/2W
R278	0113725	CF, 100ohm, 1/2W
R280	0114062	CF, 75ohm, 1/4W
R281	0113721	CF, 68ohm, 1/2W
R283	0113722	CF, 75ohm, 1/2W
R284	0114151	CF, 680ohm
R290	0100077	CF, 3.3kohm, 1/8W
R291	0100027	CF, 27ohm, 1/8W
R301	0114163	CF, 1.2kohm
R302	0100109	CF, 68kohm, 1/8W
R303	0114141	CF, 270ohm
R304	0114133	CF, 120ohm
R305	0159514	VR, 1kohm-B
R306	0100053	CF, 330ohm, 1/8W
R310	0100073	CF, 2.2kohm, 1/8W
R311	0159537	VR, 10kohm-B
R312	0100077	CF, 3.3kohm, 1/8W
R313	0151338	VR, 5kohm-B
R314	0159511	VR, 500ohm-B
R315	0100093	CF, 15kohm, 1/8W
R316	0114143	CF, 330ohm
R317	0100050	CF, 240ohm, 1/8W
R319	0100065	CF, 1kohm, 1/8W
R320	0100065	CF, 1kohm, 1/8W
R321	0100099	CF, 27kohm, 1/8W
R322	0114145	CF, 390ohm
R324	0100075	CF, 2.7kohm, 1/8W
R331	0114141	CF, 270ohm
R332	0114063	CF, 82ohm
R333	0114145	CF, 390ohm
R334	0100062	CF, 750ohm, 1/8W
R340	0100060	CF, 629ohm, 1/8W
R351	0100063	CF, 320ohm, 1/8W
R352	0100081	CR, 4.7kohm, 1/8W
R353	0100079	CF, 3.9kohm, 1/8W
R354	0114161	CF, 1kohm
R359	0100073	CF, 2.2kohm, 1/8W
R360	0100059	CF, 560ohm, 1/8W
R364	0100050	CF, 240ohm, 1/8W
R365	0100041	CF, 100ohm, 1/8W
R366	0114137	CF, 180ohm
R367	0151279	VR, 200ohm-B
R368	0100065	CF, 1kohm, 1/8W
R369	0100065	CF, 1kohm, 1/8W
R371	0100073	CF, 2.2kohm, 1/8W
R374	0114211	CF, 27kohm
R375	0100093	CF, 15kohm, 1/8W
R378	0114143	CF, 330ohm
R379	0100065	CF, 1kohm, 1/8W
R380	0100091	CF, 12kohm, 1/8W
R381	0100073	CF, 2.2kohm, 1/8W
R382	0100097	CF, 22kohm, 1/8W
R383	0100105	CF, 47kohm, 1/8W
R384	0114149	CF, 560ohm
R385	0114181	CF, 6.8kohm
R387	0100065	CF, 1kohm, 1/8W
R401	0100057	CF, 470ohm, 1/8W
R403	0100065	CF, 1kohm, 1/8W
R404	0110117	OMF, 68ohm, 1W
R408	0113807	CF, 220kohm, 1/2W
R409	0100073	CF, 2.2kohm, 1/8W
R410	0100070	CF, 1.6kohm, 1/8W
R419	0113725	CF, 100ohm, 1/2W
R420	0151218	VR, 20k ohm-B
R428	0100089	CF, 10kohm, 1/8W
R429	0100097	CF, 22kohm, 1/8W
R430	0100089	CF, 10kohm, 1/8W
R431	0100097	CF, 22kohm, 1/8W
R432	0114141	CF, 270ohm
R433	0100065	CF, 1kohm, 1/8W
R434	0100065	CF, 1kohm, 1/8W
R435	0151185	VR, 1kohm-B
R436	0100065	CF, kohm, 1/8W
R437	0100069	CF, 1.5kohm, 1/8W
R438	0100083	CF, 5.6kohm, 1/8W
R439	0100083	CF, 5.6kohm, 1/8W
R440	0100053	CF, 330ohm, 1/8W
R451	0114161	CF, 1kohm
R452	0114219	CF, 56kohm
R453	0114281	CF, 100kohm
R454	0114143	CF, 330ohm

PRODUCT SAFETY NOTE: Components marked with a ⚠ have special characteristics important to safety. Before replacing any of these components, read carefully, the PRODUCT SAFETY NOTICE of this Service Manual. Don't degrade the safety of the receiver through improper servicing.

SYMBOL NO.	PARTS NO.	DESCRIPTION
R455	0114203	CF, 12kohm
⚠ R456	0119505	FR, 2.2ohm
R457	0111760	OMF, 270ohm, 5W
R458	0111760	OMF, 270ohm, 5W
⚠ R459	0119505	FR, 2.2ohm
R460	0114203	CF, 12kohm
R461	0114143	CF, 330ohm
R462	0114219	CF, 56kohm
R463	0114281	CF, 100kohm
R464	0114219	CF, 56kohm
R465	0114161	CF, 1kohm
R466	0114219	CF, 56kohm
R471	0114221	CR, 68k ohm
R472	0100097	CF, 22kohm, 1/8W
R473	0100101	CF, 33kohm, 1/8W
R474	0100107	CF, 56kohm, 1/8W
R475	0100073	CF, 2.2kohm, 1/8W
R477	0159693	VR, 2kohm-B
R479	0100079	CF, 3.9kohm, 1/8W
R480	0159633	VR, 10kohm-B
R481	0114221	CF, 68kohm
R482	0100097	CF, 22kohm, 1/8W
R483	0100101	CF, 33kohm, 1/8W
R484	0100107	CF, 56kohm, 1/8W
R485	0100073	CF, 2.2kohm, 1/8W
R489	0100079	CF, 3.9kohm, 1/8W
R490	0100107	CF, 56kohm, 1/8W
R491	0100107	CF, 56kohm, 1/8W
R492	0114139	CF, 220ohm
R493	0114139	CF, 220ohm
R494	0114161	CF, 1kohm
R495	0114161	CF, 1kohm
R501	0100065	CF, 1kohm, 1/8W
R502	0100071	CF, 1.8kohm, 1/8W
R503	0100099	CF, 27kohm, 1/8W
R504	0159537	VR, 10kohm-B
R505	0100093	CF, 15kohm, 1/8W
R506	0151257	VR, 50kohm-B
R507	0100083	CF, 5.6kohm, 1/8W
R508	0100107	CF, 56kohm, 1/8W
R509	0159537	VR, 10kohm-B
R510	0100121	CF, 220kohm, 1/8W
R512	0100091	CF, 12kohm, 1/8W
R513	0100064	CF, 910ohm, 1/8W
R514	0100067	CF, 1.2kohm, 1/8W
R515	0100064	CF, 910ohm, 1/8W
R516	0114138	CF, 220ohm, 1/4W
R517	0114297	CF, 470kohm
R518	0100079	CF, 3.9kohm, 1/8W
R519	0100083	CF, 5.6kohm, 1/8W
R520	0114139	CF, 220ohm
R521	0114139	CF, 220ohm
R522	0114139	CF, 220ohm
R523	0100045	CF, 150ohm, 1/8W
R528	0100133	CF, 680kohm, 1/8W
R553	0100067	CF, 1.2kohm, 1/8W
R554	0100067	CF, 1.2kohm, 1/8W
R601	0114141	CF, 270ohm
R602	0151298	VR, 500ohm-B
R603	0159644	VR, 10kohm-B
R605	0114203	CF, 12kohm
R606	0114203	CF, 12kohm
R607	0113753	CF, 1.3kohm, 1/2W
R608	0113774	CF, 10kohm, 1/2W
R609	0110241	OMF, 680ohm, 2W
R610	0114011	CF, 5.6ohm
R611	0114168	CF, 2kohm, 1/4W
R613	0114181	CF, 6.8kohm
R614	0114163	CF, 1.2kohm
⚠ R615	0119505	FR, 2.2ohm
R616	0114135	CF, 150ohm
R617	0114161	CF, 1kohm
R621	0100085	CF, 6.8kohm, 1/8W
R622	0151640	VR, 5kohm-B
R624	0114161	CF, 1kohm
R625	0114151	CF, 680ohm
R626	0110211	OMF, 82ohm, 2W
R627	0111786	OMF, 1.5kohm, 5W
R628	0110261	OMF, 4.7kohm, 2W
R631	0114141	CF, 270ohm
R632	0151674	VR, 1kohm-B
R633	0114169	CF, 2.2kohm
R634	0114173	CF, 3.3kohm
R635	0114169	CF, 2.2kohm
R636	0114210	CF, 24kohm, 1/4W
R637	0114169	CF, 2.2kohm
R638	0114183	CF, 8.2kohm
R640	0114133	CF, 120ohm
R642	0111786	OMF, 1.5kohm, 5W
R643	0114203	CF, 12kohm
R644	0179554	CC, 330kohm, 1/4W
R701	0110365	OMF, 6.8kohm, 3W
R702	0110355	OMF, 2.7kohm, 3W
R703	0113762	CF, 3.3kohm, 1/2W
R704	0114287	CF, 180kohm
R705	0119505	FR, 2.2ohm
R706	0119505	FR, 2.2ohm
R707	0119505	FR, 2.2ohm
R708	0113781	CF, 18kohm, 1/2W
R709	0114203	CF, 12kohm
⚠ R710	0119664	OMF, 240kohm, 1/8W
R711	0114222	CF, 75kohm, 1/4W
⚠ R712	0114173	CF, 3.3kohm
R713	0114221	CF, 68kohm
R715	0114222	CF, 75kohm, 1/4W
R716	0114207	CF, 18kohm
R717	0114173	CF, 3.3kohm
R718	0114212	CF, 30kohm
R719	0114172	CF, 3kohm, 1/4W
R720	0114163	CF, 1.2kohm
R721	0114131	CF, 100ohm
R722	0110251	OMF, 1.8kohm, 2W
R723	0114211	CF, 27kohm
R724	0114131	CF, 100ohm
R725	0114169	CF, 2.2kohm, 1/4W
R727	0141640	VR, 5kohm-B
R728	0114181	CF, 6.8kohm
R729	0114168	CF, 2kohm, 1/4W
R730	0114207	CF, 18kohm
R731	0114209	CF, 22kohm
R732	0114141	CF, 270ohm
R734	0110356	OMF, 3.0kohm, 3W
R735	0110129	OMF, 220ohm, 1W
⚠ R736	0119658	OMF, 130kohm, 1/8W
R742	0113807	CF, 220kohm, 1/2W
R743	0114204	CF, 13kohm, 1/4W
R744	0114169	CF, 22kohm
R750	0113694	CF, 5.6ohm, 1/2W
R751	0113694	CF, 5.6ohm, 1/2W
⚠ R753	0119655	OMF, 100kohm, 1/8W
R851B	0114135	CF, 150ohm
R851G	0114139	CF, 220ohm
R851R	0114135	CF, 150ohm
R852B	0151636	VR, 200ohm-B
R852R	0151636	VR, 200ohm-B
R853B	0114165	CF, 1.5kohm
R853G	0114165	CF, 1.5kohm
R853R	0114165	CF, 1.5kohm
R854B	0110271	OMF, 12kohm, 2W
R854G	0110271	OMF, 12kohm, 2W
R854R	0110271	OMF, 12kohm, 2W
R855B	0113754	CF, 1.5kohm, 1/2W
R855G	0113760	CF, ohm, 1/2W
R855R	0113768	CF, 5.6kohm, 1/2W
R856B	0113815	CF, 470kohm, 1/2W
R586G	0113815	CF, 470kohm, 1/2W
R856R	0113815	CF, 470kohm, 1/2W
R857B	0151635	VR, 1mohm-B
R857R	0151635	VR, 1mohm-B
R857G	0151635	VR, 1Mohm-B
R858B	0179593	MG, 330kohm, 1/2W
R858G	0151693	MG, 330kohm, 1/2W
R858R	0179593	MG, 330kohm, 1/2W
R862B	0114131	CF, 100ohm
R862G	0114131	CF, 100ohm
R862R	0114131	CF, 100ohm
⚠ R902	0114140	CF, 240ohm
R905	0110245	OMF, 1.0kohm, 2W
R909	0190133	WW, 120ohm
R910	0114053	CF, 33ohm
R911	0114163	CF, 1.2kohm
R912	0114175	CF, 3.9kohm
R913	0114179	CF, 5.6kohm
R914	0151209	VR, 5kohm-B
R915	0110329	OMF, 220ohm, 3W
R916	0114165	CF, 1.5kohm
R917	0114169	CF, 2.2kohm
R918	0114163	CF, 1.2kohm
R919	0114167	CF, 1.8kohm
R920	0114177	CF, 4.7kohm
R922	0114177	CF, 4.7kohm
⚠ R930	0139015	CC, 1mohm, ±10%, 1/2W
R0201	0151670	Selector switch VR
R0202	0151670	Selector switch VR
R0203	0151670	Selector switch VR
R0204	0151670	Selector switch VR
R0205	0151670	Selector switch VR
R0206	0151670	Selector switch VR

SYMBOL NO.	PARTS NO.	DESCIPTION
R0207	0151670	Selector switch VR
R0208	0151670	Selector switch VR
R0209	0151670	Selector switch VR
R0210	0151670	Selector switch VR
R0211	0151670	Selector switch VR
R0212	0151670	Selector switch VR
R0217	0114281	CF, 100kohm
R0218	0114209	CF, 22kohm
R0219	0114139	CF, 220ohm
R0220	0114151	CF, 680ohm
R0221	0114211	CF, 27kohm
R0222	0114175	CF, 3.9kohm
R0223	0114207	CF, 18kohm
R0224	0114175	CF, 3.9kohm
R0225	0114207	CF, 18kohm
R0226	0114175	CF, 3.9kohm
R0227	0114207	CF, 18kohm
R0228	0114201	CF, 10kohm
R0229	0114221	CF, 68kohm
R0230	0114201	CF, 10kohm
R0231	0114209	CF, 22kohm
R0232	0114201	CF, 10kohm
R0233	0100065	CF, 1kohm
R0234	0100065	CF, 1kohm
R0238	0114177	CF, 4.7kohm
R0239	0100085	CF, 680ohm
R0240	0114181	CF, 6.8kohm
R0241	0114209	CF, 22kohm
R0242	0114177	CF, 4.7kohm
R0243	0114175	CF, 3.9kohm
R0244	0114201	CF, 10kohm
R0245	0114177	CF, 4.7kohm
R0246	0114169	CF, 2.2kohm
R0247	0114145	CF, 390ohm
R0249	0114165	CF, 1.5kohm
R0250	0114169	CF, 2.2kohm
R0260	0110271	OMF, 12kohm, 1W
R0261	0100045	CF, 150ohm
R0262	0100045	CF, 150ohm
R0263	0100045	CF, 150ohm
R0264	0100045	CF, 150ohm
R0265	0100045	CF, 150ohm
R0266	0100045	CF, 150ohm
R0267	0100045	CF, 150ohm
R0268	0100045	CF, 150ohm
R0269	0100045	CF, 150ohm
R0270	0100045	CF, 150ohm
R0271	0100045	CF, 150ohm
R0272	0100045	CF, 150ohm
R0273	0100089	CF, 10kohm
R0274	0100089	CF, 10kohm
R0275	0100081	CF, 4.7kohm
R1101	0114167	CF, 1.8kohm
R1102	0114217	CF, 47kohm
R1103	0114281	CF, 100kohm
R1104	0114201	CF, 10kohm
R1105	0114175	CF, 3.9kohm
R1106	0114145	CF, 390ohm
R1107	0114281	CF, 100kohm
R1108	0114217	CF, 47kohm
R1109	0114209	CF, 22kohm
R1110	0114213	CF, 33kohm
R1111	0114211	CF, 27kohm
R1112	0151218	VR, 20kohm-B
R1113	0114213	CF, 33kohm
R1114	0114169	CF, 2.2kohm
R1115	0114169	CF, 2.2kohm
R1116	0114163	CF, 1.2kohm
R1117	0114209	CF, 22kohm
R1118	0114203	CF, 12kohm
R1119	0114209	CF, 22kohm
R1120	0151679	VR, 50kohm-B
R1121	0151679	VR, 50kohm-B
R1122	0114173	CF, 3.3kohm
R1123	0114173	CF, 3.3kohm
R1124	0114149	CF, 560ohm
R1125	0114149	CF, 560ohm
R1126	0114183	CF, 8.2kohm
R1129	0114175	CF, 3.9kohm
R1130	0114181	CF, 6.8kohm
R1131	0114205	CF, 15kohm
R1132	0114171	CF, 2.7kohm
R1133	0114171	CF, 2.7kohm
R1134	0114173	CF, 3.3kohm
R1135	0114173	CF, 3.3kohm
R1136	0151679	VR, 50kohm-B
R1137	0151679	VR, 50kohm-B
R1138	0151679	VR, 50kohm-B
R1139	0151679	VR, 50kohm-B
R1140	0114289	CF, 220kohm
R1141	0151679	VR, 50kohm-B
R1142	0114210	CF, 24kohm
R1143	0114210	CF, 24kohm
R1144	0114209	CF, 22kohm
R1145	0114169	CF, 2.2kohm
R1146	0114203	CF, 12kohm
R1147	0114149	CF, 560ohm
R1149	0114171	CF, 2.7kohm
R1150	0114171	CF, 2.7kohm
R1151	0114179	CF, 5.6kohm
R1152	0114179	CF, 5.6kohm
R1153	0114179	CF, 5.6kohm
R1154	0114283	CF, 120kohm
R1155	0114283	CF, 120kohm
R1156	0114179	CF, 5.6kohm
R1157	0151679	VR, 50kohm-B
R1158	0151679	VR, 50kohm-B
R1159	0151679	VR, 50kohm-B
R1160	0151679	VR, 50kohm-B
R1167	0114169	CF, 2.2kohm
R1168	0114221	CF, 68kohm
R1169	0114217	CF, 47kohm
R1170	0114209	CF, 22kohm
R1171	0114201	CF, 10kohm
R1172	0114173	CF, 3.3kohm
R1173	0114173	CF, 3.3kohm
R1174	0114179	CF, 5.6kohm
R1175	0114179	CF, 5.6kohm
R1176	0114181	CF, 6.8kohm
R1177	0114283	CF, 120kohm
R1178	0114283	CF, 120kohm
R1179	0114181	CF, 6.8kohm
R1180	0151679	VR, 50kohm-B
R1181	0151679	VR, 50kohm-B
R1182	0151679	VR, 50kohm-B
R1183	0151679	VR, 50kohm-B
R1184	0114211	CF, 27kohm
R1185	0114201	CF, 10kohm
R1186	0114171	CF, 2.7kohm
R1187	0114171	CF, 2.7kohm
R1188	0114173	CF, 3.3kohm
R1189	0114173	CF, 3.3kohm
R1190	0151679	VR, 50kohm-B
R1191	0151679	VR, 50kohm-B
R1192	0114201	CF, 10kohm
R1193	0114153	CF, 820ohm
R1194	0114183	CF, 8.2kohm
R1195	0114153	CF, 820ohm
R1196	0114285	CF, 150kohm
R1197	0114217	CF, 47kohm
R1198	0114210	CF, 24kohm
R1199	0114217	CF, 47kohm
R1200	0114201	CF, 10kohm
R1201	0114131	CF, 100ohm
R1202	0114173	CF, 3.3kohm
R1203	0114009	CF, 4.7ohm
R1204	0114009	CF, 4.7ohm
R1205	0114153	CF, 820ohm
R1206	0114005	CF, 3.3ohm
R1207	0114201	CF, 10kohm
R1208	0114285	CF, 150kohm
R1209	0114163	CF, 1.2kohm
R1210	0114183	CF, 8.2kohm
R1211	0114163	CF, 1.2kohm
R1212	0114210	CF, 24kohm
R1213	0114210	CF, 24kohm
R1214	0114210	CF, 24kohm
R1215	0114203	CF, 12kohm
R1216	0114201	CF, 10kohm
R1217	0114141	CF, 270ohm
R1218	0114181	CF, 6.8kohm
R1219	0114009	CF, 4.7ohm
R1220	0114009	CF, 4.7ohm
R1221	0114169	CF, 2.2kohm
R1222	0114009	CF, 4.7ohm
R1223	0114201	CF, 10kohm
R1224	0114163	CF, 1.2kohm
R1225	0114183	CF, 8.2kohm
R1226	0114163	CF, 1.2kohm
R1227	0114281	CF, 100kohm
R1228	0114281	CF, 100kohm
R1229	0114281	CF, 100kohm
R1230	0114281	CF, 100kohm
R1231	0114201	CF, 10kohm
R1232	0114141	CF, 270ohm
R1233	0114173	CF, 3.3kohm
R1234	0114009	CF, 4.7ohm
R1235	0114009	CF, 4.7ohm
R1236	0114169	CF, 2.2kohm
R1237	0114009	CF, 4.7ohm

SYMBOL NO.	PARTS NO.	DESCRIPTION
R1238	0114201	CF, 10kohm
R1239	0114163	CF, 1.2kohm
R1240	0114183	CF, 8.2kohm
R1241	0114163	CF, 1.2kohm
R1242	0114281	CF, 100kohm
R1243	0114281	CF, 100kohm
R1244	0114281	CF, 100kohm
R1245	0114217	CF, 47kohm
R1246	0114210	CF, 24kohm
R1247	0114201	CF, 10kohm
R1248	0114141	CF, 270ohm
R1249	0114181	CF, 6.8kohm
R1250	0114009	CF, 4.7ohm
R1251	0114009	CF, 4.7ohm
R1252	0114169	CF, 2.2kohm
R1253	0114009	CF, 4.7ohm
R1254	0114009	CF, 4.7ohm
R1255	0151679	VR, 50kohm-B
R1256	0114201	CF, 10kohm
R1258	0114201	CF, 10kohm
R1259	0114205	CF, 15kohm
R1260	0114181	CF, 6.8kohm
R1261	0114213	CF, 33kohm
R1271	0100103	CF, 39kohm, 1/8W
R1272	0100103	CF, 39kohm, 1/8W
R1273	0100103	CF, 39kohm, 1/8W
R1274	0100103	CF, 39kohm, 1/8W
R1275	0100103	CF, 39kohm, 1/8W
R1276	0100103	CF, 39kohm, 1/8W
R1277	0100103	CF, 39kohm, 1/8W
R1278	0100103	CF, 39kohm, 1/8W
R1279	0159711	VR, 20kohm-B
R1280	0159711	VR, 20kohm-B
R1281	0159711	VR, 20kohm-B
R1282	0159711	VR, 20kohm-B
R2001	0100089	CF, 10kohm, 1/8W
R2002	0100089	CF, 10kohm, 1/8W
R2003	0114201	CF, 10kohm
R2004	0100113	CF, 100kohm, 1/8W
R2005	0100069	CF, 1.5kohm, 1/8W
R2006	0100083	CF, 5.6kohm, 1/8W
R2010	0114209	CF, 22kohm
R2011	0100083	CF, 5.6kohm, 1/8W
R2031	0100097	CF, 22kohm, 1/8W
R2032	0100083	CF, 5.6kohm, 1/8W
R2033	0100089	CF, 10kohm, 1/8W
R2034	0100089	CF, 10kohm, 1/8W
R2035	0114143	CF, 330ohm
R2036	0100089	CF, 10kohm, 1/8W
R2051	0100073	CF, 2.2kohm, 1/8W
R2052	0100053	CF, 330ohm, 1/8W
R2053	0100083	CF, 5.6kohm, 1/8W
R2054	0100057	CF, 470ohm, 1/8W
R2056	0100065	CF, 1kohm, 1/8W
R2057	0100065	CF, 1kohm, 1/8W
R2058	0100065	CF, 1kohm, 1/8W
R2059	0100089	CF, 10kohm, 1/8W
R2060	0100073	CF, 2.2kohm, 1/8W
R2061	0100073	CF, 2.2kohm, 1/8W
R2062	0100065	CF, 1kohm, 1/8W
R2063	0100097	CF, 22kohm, 1/8W
R2064	0100101	CF, 33kohm, 1/8W

SEMICONDUCTORS

SYMBOL NO.	PARTS NO.	DESCRIPTION
D01	2332031	SLR-53URT
D05	2332031	SLR-53URT
D06	2332031	SLR-53URT
D07	2332032	SLR-53GG
D001	2332912	SLR-55GC
D002	2332912	SLR-55GC
D003	2332912	SLR-55GC
D004	2332912	SLR-55GC
D005	2332912	SLR-55GC
D006	2332912	SLR-55GC
D007	2332912	SLR-55GC
D008	2332912	SLR-55GC
D009	2332912	SLR-55GC
D010	2332912	SLR-55GC
D011	2332912	SLR-55GC
D012	2332912	SLR-55GC
D013	2332912	SLR-55GC
D014	2332912	SLR-55GC
D015	2332912	SLR-55GC
D016	2332912	SLR-55GC
D017	2332912	SLR-55GC
D018	2332912	SLR-55GC
D019	2332912	SLR-55GC
D020	2332912	SLR-55GC
D021	2332912	SLR-55GC
D022	2332912	SLR-55GC
D023	2332912	SLR-55GC
D024	2332912	SLR-55GC
D025	2330352	1S2076A
D026	2330352	1S2076A
D027	2330352	1S2076A
D028	2330352	1S2076A
D029	2330352	1S2076A
D030	2330352	1S2076A
D031	2330352	1S2076A
D032	2330352	1S2076A
D033	2330352	1S2076A
D034	2330352	1S2076A
D035	2330352	1S2076A
D036	2330352	1S2076A
D037	2332031	SLR-53URT
D102	2330351	1S2076
D103	2330351	1S2076
⚠ D151	2332791	RB-151
D152	2331201	W06B
D251	2330351	1S2076
D252	2330351	1S2076
D271	2330351	1S2076
D302	2330351	1S2076
D305	2330351	1S2076
D308	2330351	1S2076
D352	2330351	1S2076
D353	2330351	1S2076
D354	2330351	1S2076
D501	2330351	1S2076
D503	2330351	1S2076
D504	2330351	1S2076
D601	2330251	V06C/SIB01
D602	2330251	V06C/SIB01
D603	2330352	1S2076A
D604	2330553	VO9G
D609	2330351	1S2076
D610	2330352	1S2076A
⚠ D701	2330551	VO9C
⚠ D702	2330551	VO9C
⚠ D703	2330551	VO9C
D704	2330564	V11N
D705	2330352	1S2076A
⚠ D710	2330192	SB-2C (Y)
⚠ D901	2331471	V17C
⚠ D902	2331471	V17C
⚠ D903	2331471	V17C
⚠ D904	2331471	V17C
⚠ D905	2330251	V06C/SIB01
⚠ D906	2330251	V06C/SIB01
⚠ D907	2330251	V06C/SIB01
⚠ D908	2330251	V06C/SIB01
⚠ D909	2330251	V06C/SIB01
⚠ D911	2330251	V06C/SIB01
⚠ D912	2330251	V06C/SIB01
⚠ D918	2330631	HZ-7 (A)
D919	2340331	MV-13
D920	2330351	1S2076
D0201	2330352	1S2076A
D0202	2330352	1S2076A
D0203	2330352	1S2076A
D0204	2330352	1S2076A
D0205	2330352	1S2076A
D0206	2330352	1S2076A
D0207	2330352	1S2076A
D0208	2330352	1S2076A
D0209	2330352	1S2076A
D0210	2330352	1S2076A
D0211	2330352	1S2076A
D0212	2330352	1S2076A
D0221	2330352	1S2076A
D0222	2330352	1S2076A
⚠ D0223	2330352	1S2076A
D0224	2330352	1S2076A
D0225	2330352	1S2076A
D0226	2330352	1S2076A
D0227	2330352	1S2076A
D0228	2330352	1S2076A
D0229	2330352	1S2076A
D0230	2330352	1S2076A
D0231	2330352	1S2076A
D0232	2330352	1S2076A
D0233	2330351	1S2076
D0234	2330351	1S2076
D0235	2330352	1S2076A
D0238	2330352	1S2076A
D1101	2333173	1N34A
D1102	2330351	1S2076
D1103	2330351	1S2076
D1104	2330351	1S2076

PRODUCT SAFETY NOTE: Components marked with a ⚠ have special characteristics important to safety. Before replacing any of these components, read carefully, the PRODUCT SAFETY NOTICE of this Service Manual. Don't degrade the safety of the receiver through improper servicing.

SYMBOL NO.	PARTS NO.	DESCRIPTION
D1105	2330351	1S2076
D1106	2330351	1S2076
D1107	2330351	1S2076
D1108	2330351	1S2076
D1109	2330351	1S2076
D1110	2330351	1S2076
D1111	2330351	1S2076
D1113	2330351	1S2076
D1114	2330351	1S2076
D1115	2330351	1S2076
D1116	2330351	1S2076
D1117	2330351	1S2076
D1118	2330351	1S2076
D1119	2330351	1S2076
D1120	2330351	1S2076
D1121	2330351	1S2076
D1122	2330351	1S2076
D1123	2330351	1S2076
D1124	2330351	1S2076
D1125	2330351	1S2076
D2001	2330351	1S2076
D2002	2332351	1S2076
D2012	2330351	1S2076
D2031	2330351	1S2076
D2032	2330351	1S2076
D2033	2330351	1S2076
D2034	2330351	1S2076
D2038	2330351	1S2076
D2039	2330351	1S2076
D2051	2330351	1S2076
D2052	2330351	1S2076
Q071	2320143	2SC17TM
Q101	2320595	2SC458 (C) / (D)
Q103	0573480	2SC458 (R) / (C)
Q231	0573480	2SC458 (R)
Q270	2321321	2SA844 (D) / (E)
Q271	2320643	2SC1213 (D)
Q301	2320637	2SA673 (C) / (D)
Q302	2320595	2SC458 (B) / (C)/ (D)
Q303	2320595	2SC458 (B) / (C) / (D)
Q305	2320644	2SC1213 (C) / (D)
Q351	2320644	2SC1213 (C) / (D)
Q354	2320595	2SC458 (C) / (D)
Q355	2320595	2SC458 (B) / (C) / (D)
Q356	2321321	2SA844 (D) / (E)
Q358	2321321	2SA844 (D) / (E)
Q359	2321321	2SA844 (D) / (E)
Q360	0573480	2SC458 (B)
Q361	2320595	2SC458 (D)
Q421	2321321	2SA844 (D) / (E)
Q422	2321321	2SA844 (D) / (E)
Q471	2320595	2SC458 (D)
Q472	2320595	2SC458 (D)
Q601	2321163	2SC1212AC
Q602	2321415	2SC1722-05
Q603	2320631	2SA673 (B) / (C)
Q701	2321415	2SC1722-05
Q702	0573480	2SC458 (B)
⚠ Q704	2321571	2SC2027
Q705	2320646	2SC1213 (B) / (C)
Q706	2320646	2SC1213 (B) / (C)
Q707	2321415	2SC1722-05
Q851B	2321221	2SC1514
Q851G	2321221	2SC1514
Q851R	2321221	2SC1514
Q902	2321388	2SB546/2SB546A
Q903	2320663	2SC1213AC
Q904	2321591	2SD401
Q905	2320682	2SA673 (A) / (C)
Q906	2320682	2SA673 (A) / (C)
Q0201	2320663	2SC1213AC
Q0202	2320637	2SA673 (C) / (D)
Q0203	2320637	2SA673 (C) / (D)
Q0204	2320637	2SA673 (C) / (D)
Q0205	2320595	2SC458 (D)
Q0206	2321321	2SA844 (D) / (E)
Q0207	2320595	2SC458 (C) / (D)
Q0208	2321541	2SC1740 (Q) / (R)
Q1101	2320663	2SC1213A (C)
Q1102	2320663	2SC1213A (C)
Q1103	2320663	2SC1213A (C)
Q1104	2320663	2SC1213A (C)
Q1105	2320663	2SC1213A (C)
Q1106	2320663	2SC1213A (C)
Q1107	2320663	2SC1213A (C)
Q1108	2320663	2SC1213A (C)
Q1109	2320681	2SA673A (C)
Q1111	2320663	2SC1213A (C)
Q1112	2320663	2SC1213A (C)
Q1113	2320681	2SA673A (B) / (C)
Q1114	2320663	2SC1213A (C)
Q1115	2320595	2SC458 (D)
Q1116	2320595	2SC458 (D)
Q1117	2320681	2SA673A (B) / (C)
Q1118	2321592	2SD401
Q1119	2321381	2SB546
Q1120	2320595	2SC458 (D)
Q1121	2320595	2SC458 (D)
Q1122	2320681	2SA673A (B) / (C)
Q1123	2321592	2SD401
Q1124	2321381	2SB546
Q1125	2320595	2SC458 (D)
Q1126	2320595	2SC458 (D)
Q1127	2320681	2SA673A (B) / (C)
Q1128	2321592	2SD401
Q1129	2321381	2SB546
Q1130	2320595	2SC458 (D)
Q1131	2320595	2SC458 (D)
Q1132	2320681	2SA673A (B) / (C)
Q1133	2321592	2SD401
Q1134	2321381	2SB546
Q2001	2320595	2SC458 (D)
Q2002	2320595	2SC458 (C) / (D)
Q2003	2320637	2SA673 (C) / (D)
Q2011	2320595	2SC458 (D)
Q2031	2321321	2SA844 (D) / (E)
Q2052	2320595	2SC458 (D)
Q2053	2320595	2SC458 (D)
TH701	2340361	112103-3

COILS/TRANSFORMERS

SYMBOL NO.	PARTS NO.	DESCRIPTION
L051	2120333	Filter coil
L071	2141776	MD-7
L201	2122162	Filter coil
L202	2161845	Filter coil
L203	2161845	Filter coil
L204	2140887	IF coil
L205	2120079	Peaking coil
L206	2142015	Mold if coil
L207	2142015	Mold if coil
L208	2121693	Peaking coil
L209	2120482	Filter coil
L210	2120482	Filter coil
L302	2121701	Peaking coil
L303	2121698	Peaking coil
L304	2121702	Peaking coil
L305	2121701	Peaking coil
L306	2122231	Axial coil
L351	2141148	1H DL coil
L352	2121692	Peaking coil
L353	2141148	1H DL coil
L404	2121698	Peaking coil
L405	2141012	S-IF trans.
L501	2160831	Settle coil
L502	2122241	Axial coil
L503	2122241	Axial coil
L504	2122241	Axial coil
L701	2120482	Filter coil
⚠ L702	2162541	H. size coil
L703	2122099	Filter coil
⚠ L705	2161722	Coil
L706	2120486	Filter coil
L707	2122099	Filter coil
L708	2120333	Filter coil
L851B	2120124	Peaking coil
L851G	2120124	Peaking coil
L851R	2120124	Peaking coil
⚠ L901	2121672	Filter coil
L903	2120333	Filter coil
L904	2120333	Filter coil
L0201	2120486	Filter coil
L1101	2120484	Filter coil
T501	2141533	Band pass trans
T601	2270871	Bow transformer
T701	2260021	H. drive trans.
⚠ T704	2432421	Flyback trans.
⚠ T705	2270882	Flyback transformer
⚠ T901	2212731	Power transformer A
⚠ T902	2212741	Power transformer B

MISCELLANEOUS

SYMBOL NO.	PARTS NO.	DESCRIPTION
CP056	2790221	Compound component
CP057	2790221	Compound component
CP201	2300071	Saw filter HW2061
CP702	0194035	Focus pack
⚠ CP902	2370142	Module HM9102
MF201	2142241	Ceramic filter 4.5MHz
MF401	2140631	Compound component
⚠ M701	2370542	Vert. module HM7052
⚠ M901	2370361	Module HM9121
⚠ F901	2720587	Fuse 4A
⚠ F903	2720583	Fuse 1.5A
⚠ F905	2720812	Fuse
⚠ F906	2720812	Fuse
⚠ F907	2720584	Fuse 2A
⚠ F908	2720584	Fuse 2A
⚠ F909	2720587	Fuse 4A
DL301	2162073	Delay line
DL351	2790561	Delay line
P901A	2370185	R. module HM9015
⚠ RL151	2640193	Power relay
⚠ SP401	2411601	Speaker 120x120mm
⚠ SP402	2410793	Speaker 50mmx50mm
⚠ SP403	2411601	Speaker 120x120mm
⚠ SP404	2410793	Speaker 50mmx50mm
S01	2630631	Switch-key
S02	2630631	Switch-key
S0213	2631053	Push switch
S2001	2620281	Slide switch
S201	2630771	Push switch
S202	2630771	Push switch
S203	2631123	Push switch
S901	2631532	Push off power switch
S902	2631125	Push switch
Z0201	2331084	Diode silicon UPC-574J (AG)
⚠	2352587	Color picture tube 180RB22 (R)
⚠	2352588	Color picture tube 180RB22 (G)
⚠	2352589	Color picture tube 180RB22 (B)
	2423457	Tuner ET-341
⚠	2441471	Deflection yoke
	2581552	Remote control receiver
	2620134	Slide switch
	2620541	Slide switch
	2630982	Switch selector 15P
⚠	2658893	CPT socket
	2661753	Plug
	2687183	Video terminal board
	2687563	UL. CS for antenna box
	2687841	4P push terminal
	2720221	Fuse holder
	2741733	Power cord
	2770791	Ferrite core
	2771892	Flight beads core 004
	2781441	Earth spring
	2781692	Washer YD1A
⚠	2782611	Center pin
	2790592	Plastic lens delta 4
	3115571	Cabinet ass
	3226252	Control panel sass
	3226262	Door for control panel
	3226282	Screen ass
	3260283	Konb channel touch
	3260452	Konb-VR
	3261152	Knob-auto
	3261373	Konb touch VR
	3329884	Input output terminal ass'y
	3454602	Back cover (HCPA)
⚠	3454692	Canoe rivet
	3719342	PWB holder
	3725922	Preset driver
	3750991	Knob-AFS
	3751421	Filter
	3755041	VR cover
	3763281	Preset cover
	3763291	Channel case (Upper)
	3763421	Channel case (Lower)
	3763431	Knob-Auto
	3763881	Stay balancer
	4253411	Upper cover
	4819881	Door for cabinet
	4820011	

MEMO

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NTSC-SYSTEM VP1X Chassis